

# The Chemical Age

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## Chemotherapeutic Research

THE annual report of the Medical Research Council, published last week, lays particular emphasis on the need for increasing research in the field of chemotherapy. This type of work, based largely on the co-operative efforts of the chemist, bacteriologist and physician, is regarded in a serious light, for it has only been recognised within recent years what important contributions chemotherapeutic research can make to the future progress of medicine. It is easy to see how this recognition has come about. Until a few years ago the principal successes of chemotherapy have been in the treatment of infections caused by spirochaetes and protozoa, rather than by bacteria. Outstanding examples are provided by the application of the salvarsan group of drugs in syphilis, tryparsamide in trypanosomiasis (African sleeping sickness) and atebrin and plasmoquin in malaria.

However, the recent discovery of the value of *p*-aminobenzene sulphonamide (sulphanilamide) and related compounds, e.g., prontosil, in the treatment of bacterial infections exposed entirely new ground for investigation. Extraordinary results have already been obtained with these compounds. As a result of their application in cases of puerperal fever, the mortality rate at Queen Charlotte's hospital fell from an average of 22.7 per cent. over the years 1931 to 1935, to one of only 4.7 per cent. Beneficial effects have also been obtained in other streptococcal infections, the report quoting streptococcal meningitis as probably the most outstanding. Here, until two years ago, the mortality rate was over 90 per cent., but within the last few months no less than twenty-five recoveries have been reported following the use of substances of the sulphanilamide group. Investigations carried out so far indicate that only the fringe of the subject has been touched upon and that infinite possibilities exist for further valuable work.

The report points out that the discovery and production of chemical compounds of therapeutic value have depended almost entirely on German science and industry, and still so depends. British chemists and pharmacologists have played a distinguished part in opening up new fields in chemotherapy, but the very nature of the investigations demands the provision of organised research providing for the co-ordination of the work of those engaged in the production of chemotherapeutics and those concerned with its practical testing. In Germany, the manufacturing firms have these large research organisations which have been established at considerable financial outlay. Their discoveries are fully protected by comprehensive patents. A warning is given in the report that as a rule licences for manufacture in this country are not

granted, so that in the case of war, the Empire might be deprived of essential drugs, as in the case of salvarsan compounds in 1914.

We publish on another page a letter from Mr. J. Davidson Pratt, general manager and secretary of the Association of British Chemical Manufacturers, which draws attention, on behalf of the members of the Association, to the fact that essential chemotherapeutic compounds are already manufactured in this country and that there are few the manufacture of which is precluded by reason of foreign patents. These facts are well known in the chemical industry and there is little need for further comment. But the conditions arising in the supply of essential drugs in a wartime emergency are perhaps worth further consideration. The shortage of salvarsan compounds in 1914, quoted in the report, cannot have been due to any shortage of new materials. Phenol and arsenic acid are the starting points and these are built on by nitration, diazotisation and similar reactions of everyday use in organic synthesis. There can have been no shortage of the requisite materials (and this is typical of all synthetic drugs) in the comparatively small quantities required. Rather was there a lack of technique in pre-war days. To-day we possess that technique to a highly developed extent. In a future national emergency the foreign patents covering those few important drugs which we do not manufacture in this country, would naturally be appropriated for our use. As it is conditional upon the granting of a patent for a process of manufacture that the specification shall so fully describe the process that anyone "skilled in the art" can operate that process without preliminary experimentation, it is clear that we should experience no shortage of these drugs which we are not permitted to manufacture at the present time owing to foreign-owned patents. We are now "skilled in the art," whereas we were not in 1914.

The very aim of chemotherapy, that of finding substances which are lethal for particular parasites and yet non-toxic to the human, must of necessity be approached by trial and error methods, especially as there seems to be little connection between chemical constitution and therapeutic effect. The report states that manufacturing chemists in this country have not appeared to be willing to use their resources to build up large research organisations necessary for work of this nature, as German industrialists have done. The only alternative is a national scheme supported by public funds; last year the Government provided an additional sum of £30,000 per annum for the work of the Medical Research Council, with a special view to the development of research in chemotherapy. A central research laboratory is held to be essential.

## Notes and Comments

### I.C.I. Record Profits

THE dividend and profits announcement of Imperial Chemical Industries, Ltd., shows that the strength of the company's financial position has been still further increased, with figures for profits reaching a record high level. After providing £1,500,000 for central obsolescence and depreciation fund (against £1,000,000 in 1936) and £1,171,862 for the company's income tax and national defence contribution (£846,093 for 1936), the net income for 1937 amounts to £7,510,707, as against £7,203,329 for 1936, an increase of £307,378. £1,500,000 has been appropriated to general reserve (same as in 1936) and £172,000 (against £150,000 in 1936) for the workers' pension fund. The final dividend on the ordinary stock has been raised from 8 to 8½ per cent. The company has suffered, however, from the heavy fall in Stock Exchanges prices during the year in practically all investment markets. The book value of marketable and unquoted investments held both by the company and its home subsidiaries is £7,706,648, or a decrease on last year of £1,115,674, arising from the sales of certain holdings. At December 31 last the market or computed value was £5,882,582, or a depreciation on book value of £1,824,066 after deducting profits realised from sales.

### Testing Chemical Stoneware

THE growing use of stoneware as the constructional material in plant designed to handle chemicals of a corrosive nature, confers more than usual interest on the publication by the British Standards Institution of a new standard specification for the methods of testing chemical stoneware (B.S.S. No. 784-1938). The test methods have been prepared by a committee representative of both manufacturers and purchasers and selected as methods capable of giving consistent results with different operators, thus eliminating that bugbear of accurate testing and standardisation, the human element. Both manufacturers and purchasers will thus be provided with uniform methods of testing stoneware products to confirm their compliance with the requirements of the purchaser's specification and also to furnish data in the investigation of causes of failure. Indications have been included as to the probable values likely to be obtained on stoneware of commercial quality when using the methods of test recommended. The tests are divided into three sections, mechanical, physical, and chemical tests respectively.

### Analysis of Water Supplies

LAST week the Minister of Health issued a communication to local authorities and water companies which was in the nature of a reminder of their serious responsibilities in maintaining adequate purity of water supplies and drawing their attention to important features of organisation desirable in a body entrusted with this essential task. The communication points out that the first necessity is that the undertaking should be under the supervision of a qualified engineer in a position to give detailed personal attention to the work. Where water is being supplied without treatment, water undertakers shall keep a constant watch on the quality of the water by frequent analyses, the frequency of which depends on local conditions. The Minister states that under modern conditions more frequent analyses are needed in many cases as a minimum precautionary

measure. Where the water is treated, the treatment should, as far as possible, be automatically controlled and periodic analyses be made of the water in order to keep a check on any change in its character and on the treatment needed. The emphasis laid in the communication on frequent analysis should prove of great assistance in correcting the present state of affairs, but the matter could be taken much further. For instance, it might be arranged that the Ministry of Health could demand a definite frequency of analysis, after expert examination of the local conditions, with the requirement that waters, not falling within a legally defined limit of purity, be rejected. On Monday, the Croydon Borough Council announced their plans for the future analyses of water. Samples of raw water are to be taken by the newly-appointed water engineer and sent to an independent firm for chemical and bacteriological examination. In addition, the Medical Officer of Health is to take samples of the water supplied to the consumer and send them for analysis to the borough analyst and to a bacteriologist. This is a safe double check method, but would the procedure not be made more simple and more satisfactory, by the appointment of a qualified water analyst to work at the water company carrying out routine analyses of prescribed regularity?

### Aspects of the French Chemical Industry in 1937

IN general, states a correspondent from France, the volume of trade, both internal and export, in the French chemical industry during the past year has been satisfactory, although high manufacturing costs continued to hamper normal sales on the export market. The demand for fertilisers led to a very satisfactory volume of business in sulphuric acid and, in spite of the difficulty in obtaining supplies of pyrites, plants were worked very nearly to capacity. There was also good business done in hydrochloric and nitric acids, but sales of the latter to munition works showed a slight falling-off. On the other hand, there was practically no improvement in the glass industry, and sulphates and carbonates of soda remained correspondingly weak. On the export market, apart from considerations of price, the various limitations as to payment and the existence of quotas in many countries formed a difficulty. In the case of the Balkan countries, negotiations have been undertaken to ease the situation. The development of the Japanese chemical industry is becoming threatening and French manufacturers fear that this market must be considered as definitely disappearing.

### U.S. Chemical Exports

ACCORDING to the Chemical Division of the U.S. Department of Commerce, United States exports of chemicals and allied products registered a further advance last year, the aggregate value being the highest recorded for seven years. Figures so far available indicate that the value of these exports was in excess of \$181,000,000, which is 17½ per cent. above that of the preceding year and within 13 per cent. of 1929 levels. Almost every major item shared in the increase, particularly industrial chemicals and chemical specialities, medicinals, paints, soaps and toilet preparations. Exports of industrial chemicals, excluding sulphur, reached the figure of 27½ million dollars, compared with slightly over 22 million dollars in 1936. Paint, pigment and varnish exports were of 21½ million dollars value during the year, against 17½ in 1936.

## Vulcanising Agents for Rubber

By

T. L. GARNER, M.Sc., F.I.R.I.

THE use of ingredients other than sulphur for the vulcanising agents in a rubber mix has not become general, although there are several methods whereby rubber can be satisfactorily vulcanised in the absence of sulphur. The development of the new synthetic rubbers also calls for an entirely new compounding technique and with some of these materials sulphur, as a compounding ingredient, serves no useful purpose.

### Sulphur in Vulcanisation

In the old history of the development of the rubber industry the names of Goodyear and Hancock are usually linked as the pioneer discoverers of vulcanisation about the year 1843. The question of priority is difficult to decide and after all is of no fundamental importance, since it is well known that both investigators were working independently along similar lines and arrived at their discoveries without knowledge of the other's experiments. Sulphur had formerly been used with the idea of reducing the tackiness of unvulcanised rubber sheets, but the discovery that by its use rubber could be transformed from a plastic substance to an elastic one heralded the birth of the rubber industry as it is known to-day.

Sulphur, which is almost universally used in the vulcanisation of rubber goods, is one of the cheapest commodities available to the rubber compounding, and, but for its well known effect in rubber mixings, might have become a widely used filler. The bulk of the world's requirements of sulphur is formed in Sicily where the limestone-sulphur rock is ignited in large kilns, part of the sulphur providing the heat required to melt the remainder, which is then collected at the bottom of the kiln. The method is extremely wasteful and not more than seventy per cent. of the sulphur is recovered in the process. Sulphur is also found in Louisiana, but at considerable depths, the method of extraction being to force superheated water through the pipe wells into the deposit, the sulphur being thus melted and forced to the surface with the water by an air lift system. Practically pure sulphur is obtained in this manner and there is no waste.

The molecular complexity of sulphur depends upon the temperature, but up to its boiling point the molecule contains eight atoms. Above boiling point the molecular size decreases until at about 700° C. it corresponds to the formula  $S_2$ . Weber considered that the  $S_2$  molecules were responsible for vulcanisation in rubber and that the latter could only occur as the  $S_2$  molecules dissociated. Since sulphur only dissociates slightly at comparatively high temperatures a considerable excess was therefore necessary for practical vulcanisation. This theory was discounted as a result of later research, and it is now held that the different allotropic forms of sulphur which may normally be present have remarkably little divergent properties towards rubber.

### The Solubility Factor

Sulphur dissolves in rubber, fortunately, and this ensures that there is a uniform distribution of the former during the vulcanising process, even if the actual mixing process has not resulted in a very good dispersion. The solubility has been calculated to be as high as 20 per cent. at normal vulcanisation temperatures, but it falls to about one per cent. at ordinary temperatures. Obviously, therefore, mixings containing less than one per cent. of sulphur in the uncombined state should not show appreciable sulphur bloom, but in practice several factors upset this observation. For example, it has been found in practice that a rubber mixing containing a high percentage of sulphur uncombined with the rubber shows less tendency to bloom than one having a much smaller sulphur content; the reason is that the higher sulphur content ensures a crystallisation centre of undissolved sulphur within

the rubber mass, which leads to internal crystallisation of sulphur and consequently less blooming. A similar result may be obtained by introducing into the rubber relatively insoluble particles isomorphous with rhombic sulphur, thus providing the necessary internal crystallisation nuclei. With unvulcanised rubber mixings where tacky surfaces are often required, blooming and consequent destruction of the tackiness can be discouraged by maintaining uniform shop temperatures, preventing isomorphous dust settling on the rubber or being conveyed there by workers' fingers, etc., and by keeping temperatures low while mixing to ensure that a part of the sulphur remains undissolved. The use of a variety of sulphur containing a proportion of insoluble sulphur has also been suggested to assist in the latter connection. Further, since sulphur is more soluble in vulcanised than in unvulcanised rubber the presence of reclaimed rubber in a mix tends to reduce blooming.

Sulphur was formerly used in much larger amounts than is customary to-day, organic accelerators having resulted in the development of satisfactory non-blooming rubber qualities with sulphur contents of about two per cent. and in some cases below one per cent. While it is generally accepted that some chemical combination occurs between the rubber and sulphur, little is known as to the molecular compositions of the products in soft rubber. It is definite, however, that the proportion of sulphur required in the production of the latter is less than would be required to produce any simple rubber-sulphur compound. In the production of hard rubber or ebonite, for which much higher percentages of sulphur are used, the essential constituent resulting is represented by the formula  $C_{10}H_{12}S_2$ .

### Application in the Liquid and Vapour Phases

While the use of sulphur in most ordinary rubber mixings is still customary to secure vulcanisation, there are other methods of attaining good physical properties in rubber, some of which make use of sulphur-containing agents. Thus, sulphur chloride is largely used for the vulcanisation of thin rubber articles, such as dipped goods; it can be used only on thin products since the process relies on the penetration of sulphur chloride vapour into the rubber. Alternatively, a solution can be used. In the first case a suitable tank is filled with the vapour of the liquid, evaporating on the floor of the chamber, and articles are suspended in it for perhaps an hour at about 180° F. The actual time depends on the humidity. Using the liquid, the article to be vulcanised is dipped into a solution in carbon disulphide, usually 2 per cent. in strength, and while the time varies with thickness it is only a matter of seconds. In both processes articles must be thoroughly dry before vulcanisation and must be well washed after the process, or bad ageing will result. Both methods are objectionable, the sulphur chloride being a yellow poisonous liquid which fumes in the air, and has an irritating effect on the nose and throat.

In the Peachey process for vulcanisation, which was not very widely adopted, thin sheets of rubber were saturated with hydrogen sulphide and then sulphur dioxide was introduced to interact with it and thus produce active sulphur, vulcanisation taking place rapidly at ordinary temperatures.

The use of selenium which belongs to the same group in the periodic classification as sulphur, as a vulcanising ingredient, has been the subject of much research, but it is now considered as a valuable aid for use with sulphur rather than as an independent medium. It is recommended in this way to reduce the tendency of sulphur to bloom out, and also to improve the physical properties for certain applications. In the latter connection, claims made some years ago in America that selenium gives markedly improved resistance to abrasion were soon

found to be unsubstantiated, however, and it is probable that this did not help the development of this new vulcanising agent. Several patents have also been taken out for the use of organic compounds of selenium in rubber, such as selenium diethyldithiocarbamate. The use of 1,3,5 trinitrobenzene as a vulcanising agent was first suggested by Ostromislensky in 1915, since when the value of the method has been a subject of considerable controversy. There has apparently been little commercial development of this process of vulcanisation.

The vulcanisation of soft rubber cannot be regarded as a purely chemical change as only part of the rubber combines with the sulphur, the remainder undergoing some change not thoroughly understood. Theories are complicated by the fact

that heavy compounding of rubber with carbon black gives an unvulcanised product which in some ways behaves like vulcanised rubber. For example, it is not soluble in the usual rubber solvents, and its presence interferes with the removability of free sulphur.

In conclusion, reference must be made to the vulcanising of the synthetic rubbers, which are now rapidly increasing in importance. These require an entirely new technique and may be vulcanised by means of materials which in ordinary rubber are normal compounding ingredients. Thus zinc oxide is the essential vulcanising agent in some cases, so that in discussing vulcanising agents synthetic rubbers must be clearly distinguished from natural types.

## Letters to the Editor

### Home-Produced Oil

SIR.—In your issue of January 8 last, I drew attention to some of the factors concerned with the oil supplies of this country and I challenged the oft-repeated argument, that financial control of foreign oil was sufficient to ensure our supplies in time of war.

I said, "It is an unfortunate fact that of the total production of natural petroleum less than 5 per cent. is found within the British Empire. It is certainly true that British companies control over 20 per cent. of the world's supplies, but financial control should not be confused with physical control."

My remarks have not had long to wait for dramatic confirmation. I quote from yesterday's Press: "President Cardenas issued a decree expropriating all 'movable and immovable properties' of the British oil companies, under the 1936 Expropriation Act. By this single move Great Britain loses the rich Pozarica oil field, which is held by the Royal Dutch Shell Company and managed by the Mexican Eagle Company. This field has been capable of supplying all Britain's petroleum needs without shipment via the Mediterranean, and the oil is of excellent quality, especially for naval use. Meanwhile the workers have forcibly ejected the Mexican Eagle executives from their offices and refineries and have taken over the oil wells."

Whether or not the Mexican Government will be able to sustain this confiscation remains to be seen, but one or two actions of this character, should they occur at the beginning of a war, might easily decide the issue against us before a shot was fired.

In the light of this latest development, I would once more draw attention to the vital necessity of increasing our supplies of home produced oil by every means in our power.—Yours faithfully,

W. A. BRISTOW.

Low Temperature Carbonisation, Ltd.,  
28 Grosvenor Place,  
London, S.W.1.  
March 23, 1938.

### Drugs in Time of War

SIR.—In order to dispel any public anxiety which may arise from the comments in the press regarding a possible drug famine in the event of war, I am instructed to submit the following observations on behalf of the members of this Association engaged in the production of drugs and medicinal products.

The comments in question relate to the recently published report of the Medical Research Council in a paragraph of which it is stated that "the special needs of the British Empire in this respect have to be met almost entirely from foreign sources." It is understood that this paragraph was intended to refer exclusively to one class of chemical compounds known as chemotherapeutic products, which are of great importance for the treatment, *inter alia*, of tropical diseases. The comments in the Press show that it is liable to grave misinterpretation and this we wish to correct.

During the last 20 years the British Chemical Industry, with the stimulus given by the Key Industry Duties, has made such great strides that the position to-day is vastly different from what it was in 1914. Most of the synthetic products which are essential to the health services of the Empire are now manufactured in this country in adequate quantities. There are a few important products in the chemotherapeutic class which are not yet made here because they are the subject of foreign owned patents, but in the event of a national emergency, however, licenses could be obtained under British patent law to enable these products to be manufactured here.

My Association believe that the steps taken by the Government in granting a subsidy for chemotherapeutic research will do much to assist still further in the development of this important field of work.—Yours faithfully,

J. DAVIDSON PRATT,  
General Manager and Secretary.

The Association of British Chemical Manufacturers,  
166 Piccadilly,  
London, W.1.

### Congratulations!

SIR.—We received yesterday, February 8, THE CHEMICAL AGE Year Book, 1938, 16th year, and we do congratulate you on the compilation of same, also for the most valuable information to the industry that it contains. Particularly valuable is it to people such as ourselves, who are so far away from England, where so much chemical plant is manufactured and made available to the user.

Throughout the year reference is made to your Year Book for information required, whereby we get in touch with the necessary manufacturers of articles in which we are interested.—Yours faithfully,

R. BRUCE CUMING,  
Managing Director.

The Adelaide Chemical and Fertiliser Co., Ltd.,  
Royal Chambers,  
Currie Street,  
Adelaide.

### Liverpool Section of the S.C.I.

At the annual general meeting of the Liverpool Section of the Society of Chemical Industry held on March 18, the following officers were elected for the 1938-9 session:—Chairman, Mr. B. D. W. Luff; vice-chairman, Professor T. P. Hilditch; hon. treasurer, Mr. A. E. Findlay; hon. recorder, Dr. G. P. Gibson; hon. secretary, Mr. J. S. Towers, hon. auditors, Messrs. F. Robertson Dodd and James Smith. Vacancies on committee, Dr. J. P. Baxter, Messrs. G. Brearley, I. K. H. McArthur, James Smith and Edwin Thompson; group representatives, Professor C. O. Bannister (Chemical Engineering), Mr. E. Gabriel Jones (Food), Mr. B. D. W. Luff (Plastics) and Mr. A. E. Findley (Road and Building Materials).

## Passivity of Iron Induced by Pigments

### Results Obtained in Investigations of Pigment Properties and Surface Pre-treatment

PROTECTIVE painting was often regarded as a simple water-proofing process intended to exclude all corrosive substances from the metal, and thus prevent corrosion from starting, said Dr. U. R. Evans in a paper on "Passivity as induced by Pigments," read before the Oil and Colour Chemists' Association, in London, on March 10, the chair being taken by the President (Dr. G. F. New).

#### Sensibly Pervious Yet Rust-preventing

There were some classes of coatings which did give protection in this way and that protection was often effective, continued Dr. Evans. There were, however, some paint films which were, or became, very sensibly pervious and yet these paint films, applied to iron, might prevent rusting by keeping the iron passive. It had long been suspected that passivity was itself due to a film of oxide or other compound formed on the metal so that the conception of painting as a water-proofing process might perhaps still be retained, but it was logical to distinguish between (1) paint coats which protect mechanically, being themselves impervious, and (2) those which protected chemically by producing a much thinner layer of oxide or other compound upon the metallic surface, which keeps it passive.

Unless there is a substance which renders the metal passive, protection is only possible if the film is waterproof and continuous. Experiments with iron oxide paints—whose protection was solely mechanical—and red lead, which also protected by the chemical method, brought out many differences. The protection afforded by red lead was much less affected by dilution with a thinner or by the presence of foots, while under some conditions red lead afforded protection even to steel exposed at definite scratches ruled through the coat. For protection of steel against the atmosphere red lead in the priming coat covered with other coats based on iron oxide, formed a combination which had shown excellent results in several series of tests. For marine purposes, the question of the action of sulphides on protection by red lead deserved investigation. Priming coats based on metallic lead, and also suitable mixtures of red lead and graphite, could give good results. Contrary to certain statements, this was quite in accord with electrochemical principles.

Paints capable of keeping steel passive would usually be useless (sometimes worse than useless) if they were prevented from proper contact with the whole surface of the metal. Care must be taken not to shut in rust, moisture or salt below the paint, and to avoid applying paint to steel which has been weathered for such a time that small gaps have appeared in the mill scale. Opinion is moving in favour of the complete removal of the scale by sand blasting, shot blasting or pickling before painting. Footner's method, in which the scale is removed in dilute sulphuric acid and the plate is then dipped in hot wash-water and finally in hot phosphoric acid before the application of paint, is likely to be very valuable.

#### Work on Anti-Corrosive Power of Paints

Discussing the problem in greater detail, Dr. Evans said that now the paint chemist has at his disposal substances which help to render the paint film more waterproof and better able to resist abrasion, and as time went on the number of potentially useful ingredients increased. Possibly the day might arrive when the paint films would be so resistant to penetration by water or other corrosive substances, and also so resistant to mechanical wear, that the power of pigments to induce passivity would cease to interest the paint technologist. Referring to the work done at Cambridge by himself and co-workers on the power of paints to inhibit corrosion, he

said he did not wish to imply that the power of a pigment to render iron passive was discovered at Cambridge. Much earlier experiments, largely in America, had strongly suggested this power, but many years ago he had felt that certain matters had not been fully established or entirely cleared up, and it was for this reason that experiments had been carried out by the Corrosion Group at Cambridge during the past ten years, involving the study of some thousands of specimens.

Dealing with some of the experiments in considerable detail, Dr. Evans said that a favourite scheme of protective painting is to use a priming coat of red lead (to render the iron passive) and covering this up with one or more coats of iron oxide to give mechanical protection and to exclude, as far as possible, sulphur gases which would turn the red lead to lead sulphate. Extensive tests carried out by Dr. J. C. Hudson, for the Iron and Steel Institute Corrosion Committee, seemed to indicate that this combination was possibly actually the best of the methods adopted in that work, and a series of outdoor tests on smaller specimens organised from his own laboratory representing country air, town air, marine air and mixed air, led to very similar conclusions. In another series of tests, various linseed oils were used including one sample especially rich in foots, and also a specially refined oil very free from foots. The presence of foots in paints pigmented with iron oxide was found to be very deleterious, since any small defect in the coat would affect the mechanical exclusion of corrosive influences. On the other hand, the protective power of red lead paints, which did not depend on mechanical exclusion, was found to be little affected by the foots. These results illustrated the different ways in which conditions affected the behaviour of a paint according as it exerts a mechanical or a chemical influence.

#### Passivity Due to Soluble Chemicals

It was important to understand the cause of passivity, and before the passivity produced by pigments could be understood, the passivity due to soluble chemicals must be considered. If powdered potassium chromate were mixed with linseed oil and used as a paint on steel to be exposed outdoors, it would probably prevent rusting for a time, but as soon as the rain had washed away the highly soluble compound, rusting would commence. If a highly insoluble chromate were used, it would escape being washed away, but the concentration of the chromate in the water which soaked through the film would probably be insufficient to prevent rusting, assuming the paint coat to be pervious. Evidently some chromate of intermediate solubility was called for, sufficiently soluble to confer passivity, but sufficiently sparingly soluble to survive for a considerable period. Zinc chromate was to-day a popular ingredient of priming coats, whilst for light alloys, strontium and barium chromates had been used in certain tests. Lead chromate had sometimes been criticised as being too sparingly soluble, but there might be conditions where it would be useful.

Potassium chromate—although an inhibitor in neutral solutions—was an accelerator of corrosion if added to an acid, because it acted as a depolariser. The same thing was true of chromate pigments. Almost any substance which would produce a sparingly soluble body as the primary corrosion product would stifle corrosion by sealing weak points in the otherwise imperfect oxide film. Even oxygen, which normally acted as a stimulator of corrosion, could inhibit attack if supplied to the whole surface in such excess that the transformation of ferrous hydroxide to hydrated ferric oxide occurred in physical contact with the iron, thus sealing the weak points in the skin.

It was sometimes objected that metallic lead paints (unless completely non-porous) ought, according to electrochemical principles, to accelerate corrosion, since lead was generally cathodic to iron. It was concluded that either lead paints were bad or that the electrochemical view of corrosion was faulty. Dr. Evans said that in his view this argument was unsound. There was also a confusion of thought in the consideration of graphite as a pigment because experiments had shown that suitable mixtures of red lead and graphite, applied in contact with iron, far from inducing corrosion served to inhibit it, and such mixtures were now being largely and successfully applied as a ground coat for important structural work.

### Red Lead in Marine Conditions

Extensive tests carried out on behalf of the Institution of Civil Engineers had shown red lead to be an excellent preservative for steel in sea air, but some of the tests on painted steel immersed in sea water and fresh water at Cambridge suggested that traces of sulphides could cause the protection due to red lead to break down under conditions where otherwise it was excellent. However, the conditions of these tests were quite unlike marine service conditions, and it would be wrong to draw from them any conclusion except that the matter deserved further investigation. It was to be hoped that the question of possible pitting below red lead, and particularly the action of sulphides and sulphate-reducing organisms would receive close attention in the marine tests now being planned by the Iron and Steel Institute.

Fortunately, continued Dr. Evans, rust could be removed by vigorous wire-brushing. Traces might remain and would be shut in below the paint, but they seemed to do little harm provided the surface was completely dry when the paint was applied, and provided salt was absent. The removal of mill scale was much less easy than the removal of rust. In certain experiments carried out by Lewis and himself, Dr. Evans said specimens were weathered for different periods, so as to remove different amounts of mill scale, and were then brushed free from rust, paint, and again exposed to the weather. It was found that if the mill scale had been wholly removed by long continued weather, the paint remained firm for long periods; fairly good results were obtained when the paint was applied to an unweathered surface completely covered with scale, but where the weathering had proceeded for a short time so as to remove scale over small areas, very intense rusting occurred below the paint at these areas, and the scale and paint were pushed away together, causing serious and rapid breakdown. It was not the presence of residual rust left at these points which caused the breakdown (there was just as much rust left on the specimens weathered completely, which behaved excellently); failure was due to the presence of small bare areas surrounded by large scale-covered areas. Laboratory experiments had shown that even on unpainted specimens, this combination might cause intense corrosion. It was most important to avoid applying paint to steel which had small gaps in the mill scale, because the steel was then in a most dangerous state from the point of view of corrosion.

### Removal of Mill-Scale from Steel

Some engineers tried to apply paint to the unweathered steel which carried the mill-scale intact, but it was difficult to protect structural steel both from accidental abrasion and weathering on its way to the place of erection, so as to keep the scale complete, and in any case where the steel had to be pierced for rivet-holes, the scale would be interrupted. Even assuming it were possible to obtain the first painting over a complete layer of scale, it was likely that trouble would only be deferred to the time of repainting, when the painters would be faced with a surface covered with scale which had gaps in it. There was room for honest differences of opinion on this point, but the belief was gaining ground that it was best to remove all the scale before the first paint was applied.

One method of doing this was to expose the steel to the weather until the whole of the scale was loosened, but on some kinds of steel a very long period was needed to obtain this result and there was some danger that pitting might have started at the original gaps in the steel.

In a few years it might be possible to produce at the steel works, plates or sections bearing a scale which would peel off readily after a short exposure to the weather, but until such a material was available it was usually necessary to remove scale by means of sand-blasting, shot-blasting or pickling. Sand blasting, however, was not without danger to health and on these grounds shot blasting was to be preferred. Comparatively little information was available regarding the chemical behaviour of shot blasted surfaces, but probably most of what was known about sand-blasted surfaces would apply to shot-blasted surfaces also. Sand-blasting applied to the surfaces of a structure after erection left the structure in a condition very susceptible to rusting, and if there was delay in applying the paint bad results might be expected, especially if the climate was damp and corrosive. It had been recommended, for marine practice, that sand-blasted plates should be allowed to rust for a few days, in order to use up the susceptible parts of the metal, and that the rust should then be removed by brushing, and paint applied. Such a practice might be suited to marine conditions, but comparative exposure tests in the Cambridge atmosphere showed that sand-blasted steel specimens on which the paint had been applied to the clean unrusty surface behaved better than those which had been allowed to rust before being wire-brushed and painted.

### The Pickling Process

Whilst pickling could not be applied to an erected structure, in modern practice large parts could be treated before erection. Misgivings were often expressed by engineers as to the effects of traces of acid or wash-water left on the metal and shut in below the paint, but comparative experiments at Cambridge on specimens in which acid or water was intentionally shut in below the paint seemed to show that these fears were exaggerated; in any case, it was possible to finish the pickling process in a bath which induced passivity. In the process recently worked out by Footner, plates were pickled in warm 5 per cent sulphuric acid, then dipped in warm wash-water and finally in hot 2 per cent. phosphoric acid. The plates emerged from this bath covered with a slaty coat of iron phosphate and, being hot, dried spontaneously and very rapidly so that the paint was applied to a dry and still warm surface, condensation of moisture being impossible. The phosphate coat conferred a slight protection against corrosion, even in the absence of paint, but its main function was to form a key for the paint and to prevent under-rusting which might force the paint-coat away from the metal. This process, concluded Dr. Evans, was cheaper and more convenient than the old plan of using phosphoric acid as the pickling agent, and, although some time must elapse before its value could be accurately assessed, there was good reason to hope that Dr. Footner's procedure might prove to be one of the greatest advances in the efficient protection of steelwork by means of paint.

### Ten Years Back

#### From "The Chemical Age," March 24, 1928

The total value of the dyes and colours exported by the German dye industry in 1927 was 337,000,000 marks, compared with 293,200,000 marks in 1926, and 277,600,000 marks in 1925.

\* \* \* \*

The contract for 2,200 tons of steel work for the boiler house for the extension of the Billingham Works of Synthetic Ammonia and Nitrates, Ltd., has been placed with Redpath, Brown and Co., Ltd., of Edinburgh.

## Structure of Solidified Colloids

### Investigations by Dilatometric Method

**I**N a note presented to the Academy of Sciences, Paris, by Marcel Delepine, Augustin Boutaric suggests that the dilatometric method used by Chevenard for the study of the structure of alloys can be applied with some success to that of solidified colloids, particularly artificial resins. He describes the results of his first experiments in this direction.

The apparatus used was a Chevenard differential dilatometer with mechanical registration of the dilations, temperatures being given on the abscissa and the differential dilation on the ordinate. The standard of dilation used was a bar of Pyros alloy of known constant dilation. Tests were carried out on bars of a number of commercial artificial resins, and similar results were obtained in each case. When the bar is heated from the temperature of the ambient air, the length increases, and the rate of this elongation is greatest at the beginning of the heating process, and slows down until it stops at a temperature varying with the sample between 80° and 100° C. After this point there is a contraction. If the sample is then slowly cooled it will be found that the phenomenon is not reversible, but that the sample continues to contract so that the sample after cooling will be noticeably shorter than it was before the beginning of the test.

If the same sample be heated repeatedly the phenomenon will reoccur, but the curve of elongation and contraction will be different at each successive heating. There seems, therefore, to be a permanent alteration in the internal structure of the material due to heating. Further tests tend to show that this peculiar behaviour is due to the presence of water in the structure of the resin. If a sample be heated to 100° C. and maintained at that temperature for several hours so as to permit it to dry thoroughly, its behaviour changes. Tested on the dilatometer it will be found to increase in length at a practically constant rate, giving an almost rectilinear graph. The graph obtained on heating and that given by cooling, as well as the graphs obtained on successive heatings and coolings are practically identical. By taking the same samples and permitting them to remain in a moisture saturated atmosphere for 24 hours, they will regain their original behaviour.

## Temperature Measuring Cones

### Use of Eutectic Mixtures of Salts

**T**HE use of salt mixtures with congruent melting points, in place of the usual clays, for temperature measuring cones, is advocated by Rea (*Jour. Amer. Ceram. Soc.*, 1938, 21, 98-101). The cones in general use are quite satisfactory for temperature control of the firing of ceramic bodies, because they are constructed of similar material. For more general applications they are not suitable, since they do not fall at a definite temperature, but over a range of temperatures, which is, moreover, dependent on the rate of heating.

It is proposed therefore to use eutectic mixture of salts, in order to get a series of cones which shall indicate exact temperatures by melting sharply. Only salts of sodium, lithium, potassium, magnesium, calcium, strontium, barium, aluminium, and beryllium can be considered for this purpose, all others being ruled out as being too expensive or unstable. Sulphates are the best salts, since they neither volatilise nor decompose at their melting points (they can thus be used alone, as well as in combination with other salts). Carbonates, in general decompose at their melting points, but may be used in combinations where the eutectic temperature is considerably below the melting point of the pure salt. A similar stricture is applicable to halides, on account of their volatility. Most phosphates, borates, and silicates are too viscous at their melting points, but may be used in some combinations.

A complete list of salts and salt mixtures for cones to cover the range 500°-1,000° in approx. 20° steps, is given.

## Expansion in Instruments Manufacture

### Recent Extensions at the Works of Elliott Brothers

**D**URING the last two or three years considerable works extensions have been made necessary by the increased demand for Elliott instruments made by Elliott Brothers (London), Ltd. A cellulose spraying shop was erected in 1935. A new large Admiralty apparatus testing shop was opened at the beginning of 1937. The variety of apparatus manufactured has also grown in relation to the expansion of the works and instruments of all types, from "miniatures" of 2 in. dial diameter up to large power house instruments of 36 in. dial diameter, in all ranges and accuracies, are now made at Century Works, Lewisham.

Employees are now working in the most recent extension to the works, which has been built exclusively for the manufacture of measuring instruments. This building is the largest extension yet made to the works, and the floor covers an area of over 24,000 sq. feet. Fitted throughout with air-conditioning equipment, this building will play an important part in increasing the manufacturing output of measuring instruments



Interior view of the new assembly shop at the works of Elliott Brothers (London) Ltd.

and will help to meet the growing demands. It is interesting to note that whereas the total number of employees in the original Century Works amounted to between 200 and 300, the number at the present time has grown to a figure of over 1,200.

The new measuring instrument extension, as it now stands, is approximately half the size of the proposed scheme. A large area (2,687 sq. ft.) of glass in the walls of the building is provided, in addition to the "north light" roof, giving a very even comfortable daylight illumination. Paintwork inside the building is carried out in aluminium colour, which materially assists the lighting. There are 70 benches averaging 28 ft. long by 2 ft. 3 in. wide. The benches are fitted with bunsen burners and electric heaters, etc., for soldering irons. The current to the electric heaters is fed from cables running in two long troughs in the floor, each bench being provided with a master switch for the whole of its heaters. Gas is also provided from two gas pipes buried in the concrete floor, with suitable T-pieces to each bench, thus obviating the necessity of pipes, cables, etc., coming down from the roof.

In the north western corner of the building is a gallery containing all circuit breakers, fuses, etc., which control the electric light and power supply to the building, thus concentrating the entire electrical equipment in one place and leaving the walls free from long runs of cables, fuse boxes, etc. A system of "Plenum" heating is provided and the fan and heating units are mounted in a gallery in the south-eastern corner. All the air ducts are on a level with the eaves of the building, with suitable "downcomers" where required.

## New Technical Books

**COLORIMETRIC METHODS OF ANALYSIS.** Vol. II Organic and Biological. By Foster Dee Snell and Cornelia T. Snell. Pp. 815. London: Chapman and Hall, Ltd. 45s.

The first volume of this work covering the application of colorimetric methods to inorganic analysis was published in 1936. It embraced a brief account of the principles of colorimetry, a rather full description of colorimetric apparatus, and a comprehensive collection of methods for the colorimetric determination of the common and the rarer elements. There was also a section of about fifty pages devoted to the determination of hydrogen ion concentration. The present volume has fifty-two chapters, the majority of which are devoted to definite classes of organic products, for instance, hydrocarbons, alcohols, sterols, aliphatic aldehydes, cyclic aldehydes, ketones, etc. In some cases they are of special interest to the biochemist; one whole chapter is devoted to bile acids and their salts, another to uric acid and purines, and others to products ranging from tyrosine and tyramine to haemoglobin and related compounds. Drugs, including the opium and *nux vomica* alkaloids, cinchona and ergot, and miscellaneous natural alkaloids are also dealt with. In addition, one complete chapter relates to synthetic alkaloids. Hormones and vitamins provide a field of increasing importance for colorimetric methods. For instance, vitamin A can be estimated by antimony trichloride, the method of analysis being applicable to butter and other fats, bread, eggs, liver and blood; alternative methods are provided by the use of arsenic trichloride and by resorcinol and benzoyl peroxide. Two methods are described for vitamin B, five methods for vitamin C, and one method for vitamin D. A special chapter is devoted to the measurement of bleaching and decolorising power in which will be found a standard measure for the bleaching effect of sunlight and also a technique for the activity of decolorising carbons. To show the completeness of the work it is merely necessary to add that one chapter, headed "Colour of Miscellaneous Liquids," deals with the colour of water, floc from coagulants in water, red wine, turpentine, varnish, butter, and tomato juice! Some turbidimetric and nephelometric methods are included, as in the case of Vol. I, where such methods could be applied to inorganic analysis. There is a very comprehensive author's index of 20 pages and a subject index of 33 pages. A number of illustrations are given, where special apparatus is necessary for the analytical methods which are described. Taken as a whole the present volume should be found extremely useful to the works chemist, because a very large number of modern analytical methods are now based upon colorimetry and in this volume details of the technique applied to specific cases are fully set out. The mere title of the book gives no indication of its true scope. Organic research chemists, more especially those working upon biological problems, will find the book extremely useful to them.

**SUPPLEMENT TO THE PERIODICAL OF THE ASSOCIATION OF GERMAN ENGINEERS,** No. 5: "Technique of Processes." (Beihft Verfahrenstechnik, Folge 1937). Berlin: VDI Verlag G.m.b.H.

This supplement contains an interesting article on flow in filter layers, as well as an article on the physical and technical rules of crushing. Further, there are described the rules for distribution of the grain in crushed materials. In these supplements many interesting papers on chemical engineering plant appear from time to time.

**THE CERAMISTS' YEARBOOK, 1938** (Taschenbuch für Keramiker 1938). Pp. 442 + 31. Berlin: Chemisches Laboratorium für Tonindustrie und Tonindustrie-Zeitung.

This pocket book contains useful data about the characteristics of ceramic materials, glasses and enamels, analyses of raw materials, lists of books on ceramics, German producers, etc., and should be helpful to producers outside as well as in Germany.

**CHEMICAL ANALYSIS OF METALS AND ALLOYS.** By Edwin Gregory and Walter W. Stevenson. Pp. 375. London: Blackie and Son, Ltd. 15s.

A modern alloy steel may contain between eight and twelve different elements. The introduction of these additional alloying elements has created many problems for the analyst, and methods have had to be devised for their separation not only from iron, and from each other, but from other elements which may be normal constituents of the alloy. Methods which were suitable for the analysis of simple steels have had to be modified, or even discarded, and new processes have had to be devised in order that the content of each element might be accurately determined. Formerly, the only elements in steel to be considered were carbon, manganese, silicon, sulphur and phosphorus, and, occasionally, nickel and chromium. Present-day metallurgical chemists, however, must be familiar with the reactions of the more important compounds of 20 to 30 elements. The first part of the book under review deals essentially with the fundamental principles of physical chemistry, the chemical properties of the elements and their compounds, and the physical principles involved in general analytical technique. For instance, Chapter III deals with such operations as weighing, filtration, the making-up of standard solutions, and the calibration of measuring apparatus. The second part deals with the actual analytical methods, according to the most recent practice. Those methods which are described have been found by the authors to give exceedingly satisfactory results; wherever necessary, alternative methods are suggested. There are very few references, for the reason that a complete list of references would have increased the size of the book and would have been a difficult and rather unnecessary task.

**DIFFUSION AND CHEMICAL REACTIONS IN THE SOLID PHASE** (Diffusion und Chemische Reaktion in festen Stoffen). By Dr. Wilhelm Jost. Pp. 230. Dresden and Leipzig: Theodor Steinkopff.

Much less is known about the laws governing the reactivity of solid substances—owing to the great experimental and theoretical difficulties—than about reactions in the gaseous phase. It is therefore running a risk to give a treatise on this subject, but the author has, nevertheless, accomplished the task very well. His book deals with the theory and the experimental research work on the different stages of the reactions and conditions responsible for the speed of reaction. Very valuable help has been furnished for further development in this line of research.

## Chemical Manufacture in India

### New Works for Alkali and Chlorine

**T**HE Alkali and Chemical Corporation of India, Ltd., has been started under the auspices of Imperial Chemical Industries (India), Ltd., with a capital of Rs 50,000,000 to develop the heavy chemical industry throughout India. The company proposes to start upon the erection of works for the manufacture of alkalies, in particular sodium carbonate and caustic soda, and chlorine.

Detailed technical investigation of the salt and limestone resources in the salt range in the Punjab has proved that they offer the most suitable source of supply for the establishment of the soda ash industry, and it has been decided to establish the works at Khewra in the Jhelum District of the Punjab. It is estimated that to begin with it will be possible to produce soda ash to the extent of about 20,000 tons per year.

The works for the manufacture of caustic soda and chlorine will be erected on a site near Calcutta, this locality having been selected by reason of the demand for these products in this area, and because supplies of raw materials necessary for manufacturing purposes are readily available. The registered office of the company will be 18 Strand Road, Calcutta.

## Organolites : Organic Base-Exchange Materials\*

By  
HARRY BURRELL

RESEARCHES carried out in the laboratory of the Ellis Foster Co., Montclair, N. J., have led to the development of synthetic organic base-exchange materials which show certain advantages over the phenol-aldehyde type and which possess qualities such as cheapness, high exchange capacities, and resistance to aggressive waters which indicate that they may be of considerable value industrially. The organolites are prepared by rendering initially water-soluble wood extracts, especially those of the tannin type, insoluble by treatment with concentrated acids—for example, sulphuric acid. They will exchange either sodium or hydrogen ions for calcium or magnesium, and exhibit some increase over initial capacity with each of the first few regeneration cycles.

### Theory of Organolites

Why such materials exhibit base exchange is not definitely known. In the case of the polyhydric phenol-formaldehyde resins, it is probable that large molecules are built up in the way usual for phenol-formaldehyde condensation (1) to produce substances which are capable of base exchanging in a manner similar to that of humus or lignin derivatives—that is, through functional phenolic groups (2, 3, 4).

When tannins are treated with concentrated sulphuric acid, a number of reactions undoubtedly occur simultaneously. Dehydration, oxidation, sulphonation or sulphation, and polymerisation all play a part in insolubilisation. It may be noticed, incidentally, that this is rather anomalous since sulphonation is a well-known method for rendering organic substances water soluble. At any rate, the end effect is evidently the formation of molecules, which are of such size as to be water insoluble and which contain groups such as hydroxyl or sulphonic which are capable of salt formation. These functional groups probably react with cations and hold them insoluble until released by the mass action of the regenerating solution (5).

### Phenol-Aldehyde Resins

The work of Adams and Holmes (6) on softening water with the quebracho-formaldehyde product was repeated, and the resin was found to have definite base-exchanging power. Although the resin was prepared according to the directions of the original investigators, the method of determining the capacity differed slightly. It was desirable to use a procedure which would (a) be applicable to a large number of diverse products to give comparative data; (b) provide laboratory data indicative of possible operating conditions with reasonable accuracy; (c) require a minimum of time and material per determination, and (d) require a minimum of "impure" (artificially hardened) water for testing. The method used, which is a composite of various schemes given in the literature, was as follows:—

The base-exchange materials were ground, usually with a mortar and pestle, and screened through 20 on 40 mesh sieves. The classified substance was given a preliminary washing by decantation with distilled water to remove colloidal and semi-colloidal fines, and the wet slurry was poured with excess water into a glass tube 2.0 cm. in diameter to form a settled and drained column 10.0 cm. high. The glass tubes were constricted at one end to about 15 cm. in diameter, and into this cone-shaped section was fitted a perforated porcelain plate 2-cm. in diameter. A very thin asbestos mat was placed on the plate in the manner ordinarily used in preparing a Gooch crucible, except that suction was not used. This supported the column of material to be tested; on top was placed another perforated plate which served to distribute the inflowing water and thus minimise channeling.

\* Abstracted from *Industrial and Engineering Chemistry*, March, 1938.

The prepared filter bed was further washed by allowing distilled water to drip through it from a separatory funnel. It was then tested by allowing a solution of known hardness (about 400 p. p. m.) to flow through from a dropping funnel, usually at a rate of about 200 cc. per hour. The effluent was collected in 50-cc. portions and was titrated with standard soap, according to the method of Scott (7). When acid was used as a regenerant, the softened water was neutralised with 0.1 N sodium hydroxide, using bromothymol blue as indicator, before titrating with soap solution. When the effluent contained 5 or more p. p. m. hardness as calcium carbonate, the column was regenerated by allowing about 250 cc. of 10 per cent. sodium chloride to flow through a period of 1 hour and was then flushed with distilled water; the determination was repeated three times. This procedure was used in testing all the materials discussed in this paper, unless otherwise noted.

The hard water was prepared by dissolving the appropriate amount of calcium chloride or calcium sulphate (no appreciable difference was found by varying the anion) in Montclair, N. J., tap water to reach a hardness of 400 p. p. m. From the volume of water treated per cycle and the volume of material used (31.4 cc.), the capacities can be calculated.

Quebracho-formaldehyde resin was made by dissolving 100 grams of sulphated quebracho extract in 500 cc. of water, adding 500 cc. of water and 200 cc. of 40 per cent. formalin, and heating to boiling. Fifty cubic centimetres of concentrated hydrochloric acid diluted with 150 c.c. of water were added with rapid stirring, and the entire solution quickly set to a soft gel. This gel was broken up and washed with water. When an attempt was made to use the undried material as a filter bed, it clogged, and the water percolated through at a negligible rate. The gel was dried at 40° C. to form a hard, dark brown, brittle resin. A filter of the material softened an average of 700 cc. of 400 p. p. m. water. This represents substantially the same exchange capacity as was found by Adams and Holmes (6, Table II), if corrections are made for variation in mesh size (8), for hardness of test water, and for difference in volume of the test bed.

If the resinification was carried out at room temperature, gelation took place with syneresis after about 2 minutes. The product dried to a light red powder which was too finely divided to allow percolation through a filter bed. No gel was produced if the hydrochloric acid was replaced with ammonium hydroxide.

### Other Phenolic Constituents

Several other tanning materials were reacted with formaldehyde in the same proportions and by the same procedure as with quebracho. These data are shown in the following table, together with the amount of 400 p. p. m. hard water softened per column of resin (2 cm. x 10 cm.), when 250 cc. of 10 per cent. sodium chloride were used for regenerating:—

Tannin	Form	Cc. of Water Softened.
Logwood extract	Solid	200
Hematin	Crystal	None
Fustic	Crystal	400
Sumac	Powder	None
Chestnut extract	Powder	None
Tannic acid	Powder	None
Gallic acid	Powder	None

It is evident that tannin-formaldehyde resins are not universally applicable to calcium exchange. Apparently only tannins of the catechol type produce resins which will soften water. This conclusion is verified by Table II of the Adams' and Holmes paper, as well as by the above table. All resins which are recorded as having absorbed calcium ions are of the catechol type, whereas chestnut extract, sumac, and tannic and gallic acids (pyrogallol type) softened no water.

Some evidence in favour of the theory that the phenolic groups are functional in the absorption is presented by a comparison of the logwood-formaldehyde product with that from hematin (the oxidation product of the hematoxylin which is the colouring matter of logwood). Base exchange ceases when the phenolic groups are presumably destroyed by oxidation.

### Other Resinifying Bodies

Formaldehyde is not the only substance which condenses with phenols and tannins to produce insoluble resins. Phenol-acetaldehyde resins do not usually "heat harden" or reach the C-stage, so that tannin-acetaldehyde resins might not be expected to become sufficiently insoluble to be useful as base-exchange agents. However, when acetaldehyde was substituted for the 40 per cent. formalin in preparing a quebracho resin, a hard dark-brown solid separated after boiling under reflux for 30 minutes. A column of the material softened 500 cc. of 400 p. p. m. hard water. The use of *n*-butyraldehyde or furfural gave resins which would not absorb calcium. Furfural condensation products with resorcinol or aniline were also inactive.

When quebracho extract was refluxed for 10 hours with 2 parts of acetone and 0.5 part of concentrated hydrochloric acid, and the resulting syrup was poured into 2 litres of water, a precipitate was obtained which, when dried, screened, and tested, softened 200 cc. of 400 p. p. m. hard water (200 cc. of 10 per cent. sodium chloride were used for regenerating the filter bed).

Alkyd, urea-formaldehyde, and rosin-maleic anhydride represented other species of resins tried, but none showed a sodium-calcium base exchange.

### Sulphuric Acid-Insolubilised Materials

The first of the vegetable extracts to be acid-treated was sulphated quebracho.

One hundred grams were stirred into 300 grams of sulphuric acid (specific gravity, 1.84) in a litre beaker. The mixture, spontaneously heated to 80° C., became black and sulphur dioxide was evolved. It was allowed to stand for 30 minutes after the maximum temperature was reached, when it was poured into a large volume of water. The precipitate was filtered off, washed, and dried at 110° C. This process was repeated at 50°, 100°, 125°, and 150° C.; these temperatures were maintained for 10 minutes by heating (or cooling, if necessary), and then the reaction mixtures were allowed to stand for 20 minutes more while gradually cooling. The series of dried materials was ground and tested as in the general method outlined above, and was regenerated with 200 cc. of 10 per cent. sodium chloride. The variation of capacity with temperature of preparation was investigated. The optimum value occurred in material prepared at about 80° C. and equalled 1,650 cc. of 400 p. p. m. hard water per 31.4-cc. bed of organolite.

A chestnut extract-sulphuric acid product, made by the same procedure, had the same appearance as the quebracho-sulphuric acid material, but its capacity was not as great; the optimum was 600 cc. of 400 p. p. m. hard water for the reaction temperature of 93° C. A ratio of approximately 4 parts of acid to 1 part of extract produces a material of optimum capacity.

The following table gives a list of other sulphuric acid-insolubilised substances (prepared in same way as the quebracho-sulphuric acid) with their comparative exchange capacities expressed as volume of 400 p. p. m. hard water softened per filter column when 250 cc. of 10 per cent. sodium chloride solution are used for regeneration:—

Substance Reacting with $H_2SO_4$	Cc. of 400 p. p. m. Water Softened.
Sulphited quebracho extract	1,650
Chestnut extract	600
Cutch	850
Hemlock cellulose sulphite liquor	700
Hemlock cellulose sulphite liquor (Bindex.)	1,300
Poplar cellulose sulphite liquor	850
Pine sawdust	400
Alpha flock	150
Cane sugar	150

"Bindex" is the trade name for a commercially prepared dried hemlock cellulose sulphite liquor; the other liquors used were obtained in the liquid state and dried in the laboratory.

It is evident that a wider variety of wood extracts may be used with acids for preparation of water-softening media than is possible by resinification with formaldehyde. Not only catechol and pyrogallol tannins, but also the pseudo tannins, such as sulphite liquors are applicable. The latter are rich in lignins which are known to base exchange.

The acid sludge by-product from petroleum refining yields an interesting organolite. A typical example of such a sludge is that obtained from white oil treatment; it is a black, viscous, tar-like substance with a specific gravity of about 1.4 and an odour of sulphur dioxide, and it contains essentially petroleum sulphonate acids. A product made from sulphited quebracho extract, chestnut extract, or hemlock cellulose sulphite liquor and the sludge surprisingly shows a capacity equal to, or greater than, the analogous product obtained from sulphuric acid. In addition, the yields are nearly 100 per cent. greater, based on the input of vegetable extract.

### Acid Regeneration

An important advantage of organolites over zeolites is that they may be regenerated with an acid whose anion constituent forms a soluble salt with the cation exchanged for the hydrogen ion. The acid insolubilised organolites, as well as the Adams' and Holmes' quebracho-formaldehyde resin, are saturated with hydrogen ions as prepared, and will exchange them for calcium ions directly. They may be repeatedly regenerated by a dilute acid solution—for example, 5 per cent. sulphuric. The effluent from such a treatment is not truly softened from the standpoint of soap consumption, since fatty acids are precipitated when soap is added; but the fact that calcium or magnesium has been removed from a hard water is easily shown by adjusting the pH to 7 (e.g., by adding dilute alkali) before titrating with soap, whereupon a zero hardness determination results.

An impressive application of this process is in alkalinity control and bicarbonate removal. The contributory element of zeolite-softened waters in causing caustic embrittlement in boilers is well known (9). If the raw water contains a mixed type of hardness—e.g., sulphate as well as bicarbonate—the effluent will contain an acid which must be neutralised by some convenient method since aeration will not effect its removal. The possibility of using the anion-exchanging resins described by Adams and Holmes (6) is indicated here.

Properties other than exchange capacity, such as salt consumption, colour throwing, and density in relation to plant volume, were described.

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THE raw material now exclusively used in German synthetic rubber manufacture is butadiene (1, 3), reports Dr. K. Ziegler in *Chemiker-Zeitung* (February 16). It is made from acetylene by a complicated series of reactions. Polymerisation to a rubber-like substance (Buna) rapidly occurs in presence of sodium. In the United States, on the other hand, chief interest centres round chlorobutadiene rubber now marketed under the name of chloroprene. Butadiene is also manufactured in Russia by a contact process starting from ethyl alcohol, but it is questionable, states the writer, whether it can be so obtained in the requisite high degree of purity.

## Research on Chemotherapeutic Substances and Vitamins

### Report of the Medical Research Council

MENTION has already been made on page 239 of work at Queen Charlotte's Hospital, London, and elsewhere, on the chemical treatment of bacterial infections by means of sulphanilamide and related drugs, as described in the report of the Medical Research Council for the year 1936-1937, published by H.M. Stationery Office. The report states that further experimental studies of compounds in this group have been made by Professor C. H. Browning at Glasgow University, with a grant for assistance by Dr. Jessie V. M. Robb. They have confirmed the powerful curative effects of these drugs in mice infected with different strains of haemolytic streptococci, provided that the treatment is begun soon after infection. Professor Browning and Dr. Robb have also tested the antiseptic and trypanocidal actions of new compounds prepared at various centres. Certain members of a series of phenanthridine and phenanthridinium compounds obtained from Sir Gilbert Morgan have shown marked antiseptic properties. Some of the phenanthridinium derivatives have proved, in addition, to be curative in experimental trypanosome infections. This is a new group of trypanocidal chemotherapeutic agents, and the experiments are being continued in the hope that substances possessing still higher efficacy may be found.

In extension of the work by N. and H. von Jancó and others, Professor Yorke and Dr. E. M. Lourie have shown that the synthetic bases known as "synthalin" and "synthalin B" have a powerful and direct lethal effect upon various pathogenic trypanosomes. This has provided a starting point for investigating the chemotherapeutic possibilities of a whole series of related bases, and research on the subject is being actively pursued with the chemical co-operation of Dr. H. King of the National Institute.

With an expenses grant at the Welsh National School of Medicine, Cardiff, Dr. F. Hawking has analysed the trypanocidal action *in vitro* of acriflavine and the trivalent arsenical drugs; it was shown that this could be divided into three stages, *viz.*, fixation of the drug, secondary chemical reactions, and morphological changes in the parasite preceding its death. Investigations have also been made of the reactions of relapsing fever spirochaetes to chemo-therapeutic agents *in vitro*, of the mode of action of "Bayer 205," and of the photo-sensitivity induced in trypanosomes by acriflavine.

#### Vitamins

Research into the natural occurrence and mode of action of vitamin C, or *l*-ascorbic acid, has been continued by Dr. Zilva and his assistants at the Lister Institute of Preventive Medicine.

Dr. Zilva has repeated the work of Szent-Györgyi and his colleagues on vitamin P. Vitamin P, according to these workers, was a crystalline compound, "citrin," obtained from lemon-juice; but afterwards it was found by them that "citrin" was a crystalline mixture of hesperidin and an eriodictyol glucoside. Dr. Zilva examined some "citrin" generously placed at his disposal by the Wellcome Chemical Works, a mixture of crude hesperidin and eriodictyol, and a purified sample of hesperidin. He found that these compounds in daily doses of one milligramme, had no influence on the onset of scurvy or the fatal termination of the disease. On the other hand the administration of sub-optimal doses of *l*-ascorbic acid was followed by a pathological condition in the guinea-pigs resembling that obtained by Szent-Györgyi and his collaborators.

Dr. Zilva and Dr. Johnson have extended the investigation of the enzymic oxidation of ascorbic acid. They observed that in some plants the oxidation of vitamin C takes place directly, whilst in others—such as the apple and the potato—this is due indirectly to the action of phenolases. The latter enzymes

oxidise phenol substances present in the tissues to their corresponding quinones, which in their turn dehydrogenate ascorbic acid. The velocity of the direct oxidation of ascorbic acid and its analogues by the more specific enzyme was found to be influenced by the stereo-chemical structure of these substances. Compounds in which the oxygen ring engages a hydroxyl group to the right of the carbon chain, as in *l*-ascorbic acid, were all dehydrogenated at the same rate, but at a rate much higher than that observed in the case of their enantiomorphs. The number of carbon atoms in the compound also conditioned the velocity of this reaction. A partial parallelism, therefore, exists between this process of oxidation of the compounds, on the one hand, and their antiscorbutic activity and their capacity of being retained in the animal organism, on the other.

With Dr. F. Kidd and Dr. C. West, of the Low Temperature Research Station, Cambridge, Dr. Zilva has continued the investigation of the metabolism of ascorbic acid in the apple. The ratio of ascorbic acid to dehydroascorbic acid has been found to increase in extracts of the disrupted tissues of the fruits during the period of growth, maturity and senescence. Suggestive evidence is accumulating that this is also the case in the intact fruit.

#### Lead for Chemical Plant

##### Beneficial Effect of Adding Copper and Tellurium

THE use of lead in chemical plant was discussed in a paper which Mr. Brinley Jones, of Goodlass Wall and Lead Industries, Ltd., read at the annual meeting of the Liverpool section of the Society of Chemical Industry on March. 18. The chairman of the section, Professor T. P. Hilditch, presided.

Mr. Jones described work that has been carried out in an effort to modify lead so that it withstands conditions which have previously caused failure. The problem, he said, was intimately bound up with the crystalline structure of the metal and the operations that are used for its fabrication into useful forms. Contrasting the peculiarities of pure lead with those of steel and copper, he pointed out that bending, stretching or compressing gave rise to structural changes. Methods were available for testing the qualities of the metal, for example, the effect of annealing after extension, the amount of distortion and buckling due to alternate heating and cooling, and resistance to vibration. At high temperatures structural changes took place more readily. The results obtained by these methods, using pure lead, served as a comparison for lead alloys containing copper, tellurium, and copper together with tellurium. In a lead-copper alloy, the addition of 0.06 per cent. of copper gave the best results. The effect of adding copper was to inhibit the grain growth of lead and cut out the tendency of lead to structural changes. Copper had very little influence on the "bendability" of lead. Although copper inhibited grain growth in lead, it only altered very slightly its distinctive features.

Tellurium exerted a considerable influence on the chemical properties of lead; it stopped re-crystallisation changes. The addition of 0.5 per cent. of tellurium and 0.65 per cent. of copper supplied a metal which was very valuable in jointing lead sheets.

In reply to a question put by Mr. George Hall (Soc., Aberdeen), Sir Thomas Inskip (Minister for Co-ordination of Defence) said, in the House of Commons on Wednesday, that substantial progress has been made in the establishment of calcium carbide works in South Wales. He hoped shortly to make a full and up-to-date statement when the Caledonian Power Bill comes up for second reading.

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## Personal Notes

MR. W. E. WATERHOUSE has been appointed a director of the United Premier Oil and Cake Co.

MR. JOHN SINCLAIR, of Elgin, for over 40 years manager and secretary of Miltonduff Distillery, has left personal estate valued at £2,538.

DR. B. A. KEEN, assistant director of the Rothamsted Experimental Station, has been elected president of the Royal Meteorological Society.

MR. R. A. CARDER, a director of the Anglo-American Oil Co., Ltd., has joined the board of the Petroleum Storage and Finance Corporation.

MR. W. TURNBULL, managing director of Turnbull and Stockdale, Ltd., calico printers, has retired from the Council for Art and Industry on the completion of his term of appointment.

MR. N. K. JOHNSON, formerly chief superintendent of the Chemical Defence Research Department, has been appointed director of the Meteorological Office, in succession to Sir George Simpson.

MR. H. HUMPHREY JONES, F.I.C., is celebrating his thirtieth year as principal of the Liverpool School of Pharmacy. He is a member of the Pharmaceutical Society's Board of Examiners for England and Wales.

THE LATE COLONEL EDWARD AUDIUS HIRST, of Harrogate, chairman of Hirst, Brooke and Hirst, manufacturing chemists, of Leeds, and a former member of the Leeds City Council, left £16,508 (net personality £11,923).

SIR ROBERT HADFIELD, F.R.S., chairman of Hadfield, Ltd., of Sheffield, has been awarded the Trasenster Medal and Diploma for 1938 by the Association des Ingénieurs de Liège. Previous awards include:—M. Henry Le Chatelier, the French metallurgist, and M. Georges Claude, inventor of processes for the liquefaction of air and the fixation of atmospheric nitrogen.

DR. W. A. MACFARLANE has been appointed senior research chemist to the L.M.S. Railway. Dr. Macfarlane was educated at Westminster School and Balliol College, Oxford, and since 1934 has been a scientific officer at the Fuel Research Station, where he specialised on the production of synthetic oils, and later acted as personal assistant to the director of fuel research.

MR. HENRY TYAS, a research chemist, of Hillsborough, Sheffield, and MR. DAVID MORDAUNT, of Park Edge, Hathersage, were injured in an explosion in a laboratory at the Firth-Brown Works at Attercliffe, Sheffield, on March 17. Mordaunt was extracting liquid air from a container during a test, when there was a flash and both men were thrown to the floor. Mordaunt was detained in hospital with extensive burns.

MR. FREDERICK HORTON WYNNE, deputy chief inspector of mines, has been appointed chief inspector of mines in succession to Sir Henry Walker, who has retired on reaching the age limit. Mr. Wynne, who is 60, was formerly assistant to the chief inspector at the Home Office. His appointment to the Mines Inspectorate began in 1904. Sir Henry Walker entered the Mines Inspectorate in 1902 and has been chief inspector for nearly 14 years.

DR. F. S. SINNATT, director of fuel research, Department of Scientific and Industrial Research; PROFESSOR W. E. S. TURNER, professor of glass technology, Sheffield University; DR. E. STEDMAN, lecturer in the department of chemistry in relation to medicine, Edinburgh University; PROFESSOR G. I. FINCH, professor of applied physical chemistry, Imperial College of Science and Technology; DR. J. W. COOK, professor of chemistry, Research Institute, Royal Cancer Hospital; and DR. G. D. BENGOUGH, consultant to the Chemical Research Laboratory, Teddington, have all been elected Fellows of the Royal Society.

VISCOUNT GREENWOOD has been elected president of the British Iron and Steel Federation, in succession to Sir Charles Wright.

THE LATE MR. ANTHONY KNOWLES KAYE, Huddersfield, chemical manufacturer, of A. K. Kaye and Sons, left estate valued £26,525, with net personality £25,078.



Professor W. H. Roberts, M.Sc., F.I.C., who, as announced in last week's issue, has been elected president of the Society of Public Analysts for 1938-1939

MR. M. P. APPLEBY, research manager of Imperial Chemical Industries, Ltd., at Billingham, is to receive the honorary degree of D.Sc. from Durham University. It will be conferred at the June convocation.

### OBITUARY

MR. LEOPOLD ALBU, chairman of the Phoenix Oil and Transport Co., Ltd., and of Phoenix Oil Products, Ltd., died in Rome recently at the age of 77. He was associated with a number of South African mining ventures, and was chairman of the London board of General Mining and Finance Corporation. He will be cremated at Golders Green Crematorium on March 28.

## Foreign Chemical Notes

### France

INVESTIGATIONS ARE PROCEEDING for the exploitation of copper-antimony ore deposits near Maisons (Department of Aude).

### Sweden

THE FORENADE SUPERFOSFATSFABRIKEN A.B. announces a net profit for 1937 of 855,000 crowns and again distributes a dividend of 6 per cent.

### Lithuania

PLANS FOR A CONSIDERABLE EXPANSION in casein production have been announced. Five of the larger dairies will shortly be equipped for manufacture of casein while six existing plants are to be modernised and enlarged. Production is mainly controlled by the Pienocentros Co-operative Association.

### Norway

A NEW FACTORY FOR MIXED FERTILISERS is under construction by the Norsk Hydro-Elektrisk Kvalstof A.S., at Eidanger.

EXPANSION PLANS OF THE NORSK HYDRO CONCERN include the production of a series of nitrogen products at the Heroya works, which are already manufacturing sodium nitrate, sodium carbonate and ammonium sulphate.

## From Week to Week

A NEW METHOD OF PREVENTING ICE FORMATION on aeroplanes involves the use of colloidal metal paint through which an electrical current is passed. The method can be applied, not only to the leading edges of the wings, but also to propellers, control members, wireless aerials and other parts.

ABOUT 9,800 APPLICATIONS FOR FERTILISER SUBSIDY were made in the West of England from the opening of the scheme on September 6 to January 31. About sixty per cent. of these applications came from Devon. The total quantity of fertiliser was 44,290 tons, of which 26,090 tons were basic slag and 18,200 tons lime.

A NEW STAPLE FIBRE produced by Courtaulds, Ltd., with a dyeing affinity and properties exactly like those of wool, was described by Mr. C. M. Whittaker, manager of Courtaulds' dyeworks at Droylsden, in a lecture before the Manchester section of the Society of Dyers and Colourists, on March 17. The new fibre is called "Rayolana."

CANADIAN FACTORIES engaged in the manufacture of pharmaceutical preparations in 1936, numbered 169. Capital investment totalled \$29,760,912, whilst the 3,857 persons employed earned \$4,797,458 and turned out products valued at \$22,251,550. Imports into Canada of drugs, medicinals and pharmaceuticals during 1936 were valued at \$3,207,300 of which \$1,599,809 came from the United States, and \$925,131 from the United Kingdom.

THE ANNUAL STAFF DINNER of the Leeds and Sheffield divisions of the National Benzole Co., Ltd., was held at the Queen's Hotel, Leeds, on March 18, presided over by Mr. E. G. Butler, Leeds divisional manager. The dinner was well attended by leading benzole producers. The speeches emphasised the country's dependence upon fuel supplies from overseas and the importance of fostering and increasing as much as possible the efforts being made by local benzole producers.

THE INDIAN MERCHANTS' CHAMBER appearing before the Tariff Board has made out a case for continuing the protection of the magnesium chloride industry. Since protection was granted the annual output has increased from 2,000 tons to 10,000 tons a year, and the product is now being exported to the United Kingdom, Holland, etc. If protection is withdrawn at this stage, states the Chamber, the competing countries will dump their produce on the Indian market at ridiculously low prices and kill the Indian industry.

GERMAN IMPORT DUTIES ON RUBBER, gutta percha and balata have been increased from Rm.160 to Rm.170 per double hundred-weight (one-tenth of a metric ton) as from March 21 by a decree just published in the German Official Gazette. Duties on rubber lactate are also increased proportionately to the solid rubber content. The German rubber duties have a two-fold object—first to maintain the stability of the price inclusive of duty of imported rubber at Rm. 260 per double hundredweight, and secondly, to provide funds for building "Buna" and "Guttasyn" synthetic rubber factories in Germany.

PRODUCTION OF STEEL INGOTS AND CASTINGS in the Sheffield district during February, 1938, reached 145,900 tons—8,400 tons more than in February last year, which was then a record. Aggregate tonnage to end of February was 299,400, an increase of 25,800 tons over the same period in 1937, which was then a record for the first two months of any year. N. Lincolnshire steel works also broke previous February records with a production of 110,000 tons, an increase of 15,100 tons over February, 1937. Aggregate was 223,300 tons, an increase of 23,500 tons. Pig iron output in February was 84,500 tons, an increase of 5,900 tons.

SOVIET TRADE FIGURES FOR 1937 show an increase in exports but a further slight decline in imports. Great Britain again headed the list of countries trading with the U.S.S.R., the total trade turnover between them being £30,325,480, exactly double that for the United States, which came second in total trade turnover. In 1937 Britain imported from the U.S.S.R. £22,645,800—representing an increase of nearly 60 per cent., over 1936—whereas Britain's exports to the U.S.S.R. were only £7,679,680, marking a decline of 6 per cent. in comparison with 1936. Both the United States and Germany surpassed Britain in their exports to the U.S.S.R.

THE BRYMBO STEEL Co. announce that they are taking advantage of the position created by the large accumulation of stocks on the part of their customers, through extensive importation of foreign material during the last few months, to close down temporarily their blast and steel furnaces for the purpose of reconditioning, repairing, and modernising those portions of their plant. This is being done in order to deal more effectively with their business on a return to normal conditions. This decision will have a disastrous effect on the large industrial village of Brymbo, a few miles from Wrexham. It will involve the temporary discharge of 450 men in addition to the 200 who were stopped a fortnight ago through half the sheet plant closing down.

EAGLESCLIFFE CHEMICAL CO., LTD., of Urley Nook, Eaglescliffe, Co. Durham, changed their name to Urley Nook Holdings, Ltd., on March 11.

THE ANNUAL STAFF DANCE of the National Oil Refiners, Ltd., Flandarcey, Swansea, was held in Swansea last week, when nearly 500 staff members and friends attended. Mr. W. C. Mitchell, director and general manager, was present.

TENDERS ARE INVITED by the Devon Education Committee for the supply of laboratory apparatus, etc., for extensions to the South Devon Technical College at Torquay. Details are available from the County Education Secretary at Exeter.

ASSOCIATED CLAY INDUSTRIES, in a circular to shareholders, confirm that the capital proposals have been dropped. It is stated that the proxies received indicated a substantial degree of support for the proposals, but revealed also a considerable minority of opposition, particularly from holders of the preference shares.

WHEN FIRE WAS DISCOVERED at the Wraysbury Paper Mills, near Windsor, on March 20, employees living nearby ran to assist the four fire brigades called to the outbreak. Firemen prevented the flames from reaching petrol tanks, but an oil store became involved. Several hundred employees will be thrown out of work. The mills are owned by the Bell Punch Co.

THE AUSTRALIAN FEDERAL GOVERNMENT will prohibit the export of iron ore within the next few days. The embargo is supported by Dr. Cotton, professor of geology at Sydney University, on the ground that the supplies of iron ore might be exhausted in two generations. Australia is at present consuming internally 2,000,000 tons a year. The Yampi Sound Co., which has undertaken large-scale exploitation, is protesting.

THE BRITISH DISINFECTANT MANUFACTURERS' ASSOCIATION at their annual general meeting, on March 8, appointed the following officers and executive committee for the ensuing year: Chairman, Mr. S. Bryan; vice-chairman, Mr. H. M. Spackman; hon. treasurer, Mr. R. A. Blair; hon. auditor, Mr. R. G. Berchem; executive committee: Messrs. A. D. Daysh, H. W. Mackrill, N. D. Pagden, A. S. Roxburgh, F. C. Seager, H. A. Smith and N. Thornton.

NEW PREMISES BUILT AT A COST OF £22,000 in Brewster Road, Bootle, for R. R. Minton (1930), Ltd., paint manufacturers, were opened by the Deputy Mayor of Bootle (Alderman J. W. Clark) on March 14. Mr. S. G. Catt, chairman of the company, presided at a luncheon which followed the opening ceremony. Waiters and musicians were in painters' clothes, wallpaper substituted tablecloths, and flowers decorating the tables were arranged in paint-cans. The courses were designated by trade terms such as preparation, undercoat, final colour, varnish and wash-down.

THE INTERNATIONAL WHALING CONFERENCE will be held at Oslo in April and May next. Last year the conference was attended by eleven nations—Great Britain, South Africa, the United States, Argentina, Australia, Germany, Irish Free State, New Zealand, Norway, Canada and Portugal. The two last named did not put their signatures to the agreement. Japan, which has a large interest in whaling, did not attend the conference, but it is expected that this year she will send a representative to the conference as an observer.

THE ASSOCIATION OF TAR DISTILLERS at their annual general meeting on March 15, appointed the following officers and executive committee for the ensuing year: President, Mr. H. E. G. West; vice-president, Mr. S. Robinson; hon. treasurer, Mr. C. E. Carey; hon. auditor, Mr. E. Hardman; executive committee: British Tar Products, Ltd.; Brotherton and Co., Ltd.; Burt, Boulton and Haywood, Ltd.; Wm. Butler and Co. (Bristol), Ltd.; Consett Iron Co., Ltd.; Crow, Catchpole and Co., Ltd.; Arthur J. Dickinson, Ltd.; Dorman, Long and Co., Ltd.; Gas Light and Coke Co.; Glasgow Corporation Chemical Works, Department; E. Hardman, Son and Co., Ltd.; Hardman and Holden, Ltd.; Josiah Hardman, Ltd.; Lancashire Tar Distillers, Ltd.; City of Leicester Gas Department; Lennard and Co. (Shoreham-by-Sea), Ltd.; Low Temperature Carbonisation, Ltd.; Midland Tar Distillers, Ltd.; Monsanto Chemicals, Ltd.; Thomas Ness, Ltd.; Newcastle-upon-Tyne and Gateshead Gas Co.; Normanby Park Tar Supply Co., Ltd.; North-Western Cooperative Tar Distillers, Ltd.; Powell Duffryn Associated Collieries, Ltd.; Rothervale Collieries Branch, United Steel Cos., Ltd.; Sadler and Co., Ltd.; Scottish Tar Distillers, Ltd.; Simon-Carves, Ltd.; South Bank Chemical Co., Ltd.; South-Eastern Tar Distillers, Ltd.; South Metropolitan Gas Co.; South Wales Tar Distillers; South-Western Tar Distilleries; South Yorkshire Chemical Works, Ltd.; Staffordshire Chemical Co. (1917), Ltd.; Staveley Coal and Iron Co., Ltd.; Tar Distillers, Ltd.; Thorncliffe Coal Distillation, Ltd.; Yorkshire Tar Distillers, Ltd., and Mr. W. J. U. Woolecock.

## Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### Applications for Patents

MANUFACTURE, ETC., OF ARTIFICIAL RESINS.—Deutsche Hydrierwerke, A.-G. (Germany, March 6, '37.) 7125.

MANUFACTURE OF NON-GELATINISING SYNTHETIC RESIN SOLUTION.—Deutsche Hydrierwerke, A.-G. (Germany, March 17, '37.) 7128.

MANUFACTURE OF RESIN-LIKE SYNTHETIC MATERIALS.—Deutsche Hydrierwerke, A.-G. (Germany, March 17, '37.) 7129.

MANUFACTURE OF DERIVATIVES OF METHACRYLIC ACID ESTERS.—E. I. du Pont de Nemours and Co. 7412.

DYES FOR SENSITISING PHOTOGRAPHIC SILVER HALIDE EMULSIONS.—Du Pont Film Manufacturing Corporation. (United States, March 9, '37.) 7273.

MODIFICATION OF CHARACTERISTICS OF ORGANIC COMPOUNDS.—A. C. G. Egerton. 6749.

PRODUCTION OF QUATERNARY AMMONIUM COMPOUNDS.—M. Flores, and W. Essers. (Germany, March 15, '37.) 7216; (Germany, April 16, '37.) 7217.

HYDROGENATION OF CARBONACEOUS MATERIALS.—J. P. Fraser. 6677.

PRODUCTION OF ANTHRAQUINONE DYESTUFFS.—J. R. Geigy, A.-G. (Switzerland, March 11, '37.) 7382.

PRODUCTION OF GAS MIXTURES rich in hydrogen.—Ges für Linde's Eisemaschinen, A.-G. (Germany, March 20, '37.) 6706.

MANUFACTURE OF THERAPEUTICALLY ACTIVE AGENTS.—Glaxo Laboratories, Ltd., B. K. Blount, and B. A. Hems. 7123.

MANUFACTURE OF DYESTUFFS, ETC., for colour photography.—I. G. Farbenindustrie. (Germany, March 3, '37.) 6700.

PRODUCTION OF ARTIFICIAL RUBBER-LIKE SUBSTANCES.—I. G. Farbenindustrie. (Germany, March 4, '37.) 6709.

MANUFACTURE OF TITANIC ACID ESTERS.—I. G. Farbenindustrie, A.-G. (Germany, March 4, '37.) 6898.

MANUFACTURE OF FUNGICIDAL, ETC., AGENTS.—I. G. Farbenindustrie. (Germany, March 8, '37.) 7290.

MANUFACTURE, ETC., OF ORGANIC DYESTUFFS.—I. G. Farbenindustrie. 6708.

MANUFACTURE OF LIQUID HYDROCARBONS.—G. W. Johnson (I. G. Farbenindustrie.) 7110.

STABILISATION OF POLYVINYL RESINS.—Kodak, Ltd. (United States, March 5, '37.) 7159.

TREATMENT OF CARBONACEOUS MATERIALS.—A. McCulloch. 7339.

PRODUCTION OF DRY TRITURATIONS.—G. Madaus, F. Madaus, and H. Madaus. (Germany, March 23, '37.) 6734; (Germany, April 1, '37.) 6735; (Germany, July 3, '37.) 6736.

PREPARATION OF AMIDINE DERIVATIVES.—May and Baker, Ltd., A. J. Ewins, and H. J. Barber. 7376.

PROCESS FOR ISOMERISATION, ETC., OF HYDROXY-KETO-COMPOUNDS, ETC.—Naamloze Vennootschap Organon. (June 26, '37.) 7276.

MANUFACTURE OF ARTIFICIAL SILICA STONES.—Nagybatony-Ujlaki Egyesült Ipariüvek Részvénnytársaság. (Hungary, March 5, '37.) 7134.

ISOLATION OF STEROLS.—Parke, Davis and Co. (United States, March 12, '37.) 6685; (United States, July 3, '37.) 6686.

STEROLS OF THE HORMONE TYPE.—Parke, Davis and Co. (United States, March 12, '37.) 6839.

MANUFACTURE OF STEROL DERIVATIVES.—Parke, Davis and Co. (United States, March 12, '37.) 6840.

EXTRACTING, ETC., GLYCERIDES, ETC.—Pittsburgh Plate Glass Co. (United States, May 22, '37.) 6808.

MANUFACTURE OF COMPOUNDS OF THIOUREA and formaldehyde.—F. Pollak. (Austria, May 22, '37.) 7268.

PRODUCTION OF SYNTHETIC RESINS, ETC.—F. Pollak. (Austria, Feb. 4.) 7277.

CATALYTIC OXIDATION OF UNSATURATED ORGANIC COMPOUNDS.—Research Corporation. (United States, April 13, '37.) 7099.

MANUFACTURE OF DERIVATIVES OF STEROLS.—Schering, A.-G. (United States, March 5, '37.) 7145.

EXTRACTION OF BERYLLIUM COMPOUNDS from beryllium ores.—Seri Holding Soc. Anon. (United States, March 20, '37.) 7144.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. (Switzerland, March 8, '37.) 6824.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. (Switzerland, March 13, '37.) 7071.

TRANSFORMATION OF LIQUID HYDROCARBONS INTO FUEL.—Soc. pour la Fabrication et le Commerce des Appareils Aéromotors. (Greece, March 4, '37.) 6751.

REFINING SELENIUM.—Standard Telephones and Cables, Ltd. (Japan, March 4, '37.) 6846.

FERROUS ALLOYS.—A. H. Stevens (Boroloy Metallurgical Corporation). 7235.

COMPOSITIONS COMPRISING SILICON CARBIDE.—W. J. Teunant (Carborundum Co.). 7132.

PRODUCTION OF CHROMIUM-IRON, ETC.—M. J. Udy. (United States, Jan. 22.) 7281, 7282.

STEEL ALLOYS.—Vereinigte Oberschlesische Hüttenwerke, A.-G. (Germany, March 11, '37.) 7385.

RECOVERY OF GLYCEROL from still-residues from fermentation processes.—R. A. Walmsley. 6904.

PREPARATION OF TETRALIN DERIVATIVE.—Y. Asahina. 7929.

PREPARATION OF DERIVATIVES OF TETRALYLQUINOL.—Y. Asahina. 7930.

MANUFACTURE OF ORGANIC ESTERS.—J. H. Brown, J. S. Watt, and Imperial Chemical Industries, Ltd. 8183.

TREATMENT OF ORGANIC LIQUIDS containing substances tending to form peroxides.—Carbo-Norit-Union Verwaltungs-Ges. (Germany, March 12, '37.) 7659.

MANUFACTURE OF NUCLEAR SUBSTITUTION PRODUCTS OF ANILINE, ETC.—A. Carpmael (I. G. Farbenindustrie.) 7680, 8037.

MANUFACTURE OF DIARYL COMPOUNDS.—A. Carpmael (I. G. Farbenindustrie.) 8038.

STROPHANTHUS GLUCOSIDES.—Chemical Works formerly Sandoz. (Switzerland, April 21, '37.) 7499; (Switzerland, Oct. 20, '37.) 7500; (Switzerland, Nov. 8, '37.) 7501; (Switzerland, Dec. 7, '37.) 7502.

PRODUCTION OF POLYAZO DYESTUFFS.—Chemical Works, formerly Sandoz. (Switzerland, March 13, '37.) 7333.

INSECTICIDES.—B. Collie, R. Hill, W. A. Sexton, and Imperial Chemical Industries, Ltd. 7665.

MANUFACTURE OF ORGANIC COMPOUNDS containing chlorine.—J. W. C. Crawford, N. McLeish, and Imperial Chemical Industries, Ltd. 8051.

PROTECTION OF METAL SURFACES.—Cross and Blackwell, Ltd., C. G. Summer, R. I. Johnson, and W. Clayton. 7732.

MANUFACTURE OF AMINO ACIDS.—E. I. du Pont de Nemours and Co. (United States, March 15, '37.) 8068.

MANUFACTURE OF FURFURAL-UREA CONDENSATION PRODUCTS.—H. D. Elkington (Hungarian Rubber Goods Factory Co., Ltd.). 8042.

PROCESS FOR RENDERING MATERIALS MOTH-PROOF.—J. R. Geigy, (Germany, March 12, '37.) 7498.

STRATIFORM STRUCTURES IMPERVIOUS TO LIQUIDS.—Gewerkschaft-Keramchemie-Berggarten. (Germany, March 16, '37.) 7931.

MEANS FOR PROTECTING COPPER, ETC., SURFACES.—W. V. Gilbert. 7718.

MANUFACTURE OF SUBSTITUTED CROTONALDEHYDES.—Glazo Laboratories, Ltd., and A. F. Millidge. 7529.

PRODUCTION OF FAST DYEINGS.—W. W. Groves (I. G. Farbenindustrie.) 7106, 8002.

MANUFACTURE OF SENSITISING DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) 7507.

PRODUCTION OF FAST DYEINGS.—W. W. Groves (I. G. Farbenindustrie.) 7582.

MANUFACTURE OF CONDENSATION PRODUCTS.—W. W. Groves (I. G. Farbenindustrie.) 7858.

MANUFACTURE OF VAT DYESTUFFS OF THE ANTHRAQUINONE SERIES.—W. W. Groves (I. G. Farbenindustrie.) 8006.

PRODUCTION OF CREPE EFFECTS ON ACETYL-CELLULOSE.—W. W. Groves (I. G. Farbenindustrie.) 8007.

MANUFACTURE OF SOLID DIATONIUM SALTS.—W. W. Groves (I. G. Farbenindustrie.) 8133.

MANUFACTURE OF ACYL-ACETIC ARYLIDES having substantive properties.—W. W. Groves (I. G. Farbenindustrie.) 8134.

MANUFACTURE OF POLYVINYL ACETAL COMPOUNDS.—W. W. Groves (I. G. Farbenindustrie.) 8135.

WATERPROOFING FIBROUS MATERIALS.—W. W. Groves (I. G. Farbenindustrie.) 8138.

MANUFACTURE OF PHOSPHORESCENT LITHOPONE.—W. N. Hirschel. 7512.

MEANS FOR RECORDING, ETC., THE CONTENT OF CHLORINE IN WATER.—J. Holgate. 8050.

PROCESS FOR HARDENING CASEIN FIBRES.—I. G. Farbenindustrie. (Germany, April 27, '37.) 7505.

MANUFACTURE OF CYANINE DYESTUFFS.—I. G. Farbenindustrie. (Germany, March 13, '37.) 7634.

BLEACHING OF BAST FIBRES.—I. G. Farbenindustrie. 7660.

MANUFACTURE, ETC., OF RESINOUS METAL HYPOSULPHITES.—I. G. Farbenindustrie. (Germany, March 15, '37.) 7879.

MANUFACTURE, ETC., OF RESINOUS CONDENSATION PRODUCTS.—I. G. Farbenindustrie. (Germany, March 20, '37.) 7880.

TREATMENT OF RUBBER.—I. G. Farbenindustrie. (Germany, March 19, '37.) 8160.

MANUFACTURE OF POLYMERISATION PRODUCTS.—I. G. Farbenindustrie. (Sept. 29, '36.) 7632.

PRESSURE EXTRACTION OF COALS.—G. W. Johnson (I. G. Farbenindustrie.) 7515.

MANUFACTURE OF HYDROCARBONS.—G. W. Johnson (I. G. Farbenindustrie.) 7663.

MANUFACTURE, ETC., OF CONDENSATION PRODUCTS.—G. W. Johnson (I. G. Farbenindustrie.) 7876.

MANUFACTURE OF FUELS.—G. W. Johnson (I. G. Farbenindustrie.) 7877.

MANUFACTURE, ETC., OF AMINO KETONES.—G. W. Johnson (I. G. Farbenindustrie.) 7878.

MANUFACTURE, ETC., OF DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie.) 8019.

MANUFACTURE, ETC., OF PYRROLIDINE DERIVATIVES.—G. W. Johnson (I. G. Farbenindustrie.) 8020.

PRODUCTION OF COKE.—Lurgi Ges. für Warmeteknik. (Germany, March 20, '37.) 7907.

MANUFACTURE OF ARSENATES, ETC.—K. Mackenzie. 7681.

PLASTIC FILLER.—C. Metcalf. 7580.

CYCLOPENTANO-DIMETHYL-POLYHYDRO-PHENANTHRENE CARBOXYLIC ACID DERIVATIVES, ETC.—Naamlooze Vennootschap Organon. (Holland, March 17, '37.) 8178.

PRODUCTION OF MIXTURES of hydrogen and carbon monoxide.—G. Percival, and E. W. Featherstone. 8139.

MANUFACTURE OF SULPHINIC ACID DERIVATIVES.—Schering, A.-G. (Germany, March 27, '37.) 8039.

TREATMENT OF METALLIC BATHS WITH SOLID MATERIALS.—Soc. d'Electro-Chimie, d'Electro Metallurgie, et des Aciers Electriques d'Ugine. (France, March 16, '37.) 8040.

DEOXIDATION OF STEEL BY CARBON.—Soc. d'Electro-Chimie, d'Electro Metallurgie et des Aciers Electriques d'Ugine. (France, March 16, '37.) 8041.

MANUFACTURE OF HAEMATITE CAST IRON.—Soc. d'Electro-Chimie, d'Electro Metallurgie, et des Aciers Electriques d'Ugine. (France, March 16, '37.) 8181; (France, Feb. 26.) 8182.

AROMATIC AZIDES.—Soc. des Usines Chimiques Rhône-Poulenc, and P. Viaud. 7779.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. (Switzerland, March 15, '37.) 8003; (Switzerland, Feb. 22.) 8004.

OBTAINING CREPE EFFECTS ON THREADS of fabric of cellulose esters, etc.—Soc. Rhodiacaeta. (Germany, March 13, '37.) 7932.

RECOVERY OF PHENOLIC SUBSTANCES FROM AQUEOUS LIQUORS.—South Metropolitan Gas Co., W. F. Gardner and H. Stainer. 7635.

PRODUCTION, ETC., OF CAST-IRON ALLOY.—W. J. Sparling. 8170.

PROPELLENT EXPLOSIVE CHARGES.—T. Thomson, E. Whitworth, and Imperial Chemical Industries, Ltd. 7664.

MANUFACTURE OF RUBBER.—R. M. Ungar. 7919.

PREPARATION OF UREA DERIVATIVES.—Wingfoot Corporation. (United States, July 15, '37.) 7978.

### Specifications Open to Public Inspection

PROCESS OF EXCHANGING IONS between a solution and an artificial resin and a manufacture of artificial resins therefor.—I. G. Farbenindustrie. Sept. 9, 1936. 13542/37.

COATING-COMPOSITIONS.—Carbide and Carbon Chemicals Corporation. Sept. 10, 1936. 22254/37.

ELECTROCHEMICAL PRODUCTION OF MANGANESE.—Metallic Manganese Co., Ltd. Sept. 10, 1936. 23151/37.

MANUFACTURE OF METHINE DYESTUFFS.—I. G. Farbenindustrie. Sept. 8, 1936. 23690/37.

PRODUCTION OF CASEIN.—Naamlooze Vennootschap Onderzoeksinstuut Research. Sept. 10, 1936. 23700/37.

METHOD OF PRODUCING METALS and alloys having a low content of carbon and silicon.—Wargons Aktiebolag. Sept. 9, 1936. 23718.

PROCESS FOR REMOVING WEAKLY ACID reacting organic compounds from liquids.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Sept. 9, 1936. 24514/37.

DEACIDIFICATION OF LIQUIDS.—Permutit Co., Ltd. Sept. 8, 1936. 24588/37.

PRODUCTION OF AMINES.—Kodak, Ltd. Sept. 9, 1936. 24592/37.

PROCESS AND MEANS FOR THE ENRICHMENT OF NATURAL AND INDUSTRIAL MIXTURES of hydrocarbons in aromatic hydrocarbons and for the elimination of the resin-producing constituents therefrom.—A. E. J. L. Germe. Sept. 9, 1936. 24631/37.

MANUFACTURE OF SULPHONIC ACIDS of the naphthalene series. J. R. Geigy, A.-G. Sept. 11, 1933. 24726/37.

PROCESS AND APPARATUS FOR PURIFYING, SEPARATING, AND CONCENTRATING COLLOIDAL DISPERSIONS.—Semperit Oesterreichisch-Amerikanische Gummifabrik, A.-G. Sept. 12, 1936. 24909-10/37.

### Specifications Accepted with Dates of Application

RECOVERY OF VALUABLE METALS or metal compounds from complex ores.—A. Hammarberg. June 8, 1935. 481,273.

METHODS AND MEANS FOR THE TREATMENT OF GASES.—Brinsford Chemical Works, Ltd., and E. Hene. June 6, 1936. 481,429.

PHOTOGRAPHIC DEVELOPERS.—W. W. Groves (I. G. Farbenindustrie.) June 8, 1936. 481,275.

IMPROVING ARTIFICIAL FIBROUS MATERIAL.—W. W. Groves (I. G. Farbenindustrie.) June 29, 1936. 481,185.

REFRACTORY PRODUCTS.—C. Arnold (Non-Metallic Minerals, Inc.) July 3, 1936. 481,281.

UPRIGHT, CONTINUOUSLY OPERATING CHAMBER OVENS, and process for the production of various gas mixtures, e.g., town gas

or synthesis gas, and coke from solid bituminous fuels.—W. W. Triggs (Braunkohlen-und Brikett-Industrie, A.-G. Bubiaag.) June 8, 1936. (Convention date not granted.) 481,278.

MANUFACTURE AND PRODUCTION OF SULPHUR.—G. W. Johnson (I. G. Farbenindustrie.) July 6, 1936. 481,355.

MANUFACTURE OF URETHANE-LIKE COMPOUNDS.—W. W. Groves (I. G. Farbenindustrie.) July 9, 1936. (Samples furnished.) 481,357.

PRODUCTION OF NON-OXIDISING GASES.—General Electric Co., Ltd., and I. Jenkins. July 7, 1937. 481,283.

MANUFACTURE OF ESTERS.—Kodak, Ltd. (Eastman Kodak Co.) Aug. 1, 1936. 481,189.

MANUFACTURE OF AZO DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie.) Sept. 8, 1936. 481,290.

PRODUCTION OF NICKEL CARBONYL and materials suitable for use therein.—Mond Nickel Co., Ltd., and A. E. Wallis. Sept. 9, 1936. 481,511.

PRODUCTION OF ORGANIC HALOGEN COMPOUNDS.—E. W. Fawcett, and Imperial Chemical Industries, Ltd. Sept. 11, 1936. 481,515.

INDIGOID DYESTUFFS.—Imperial Chemical Industries, Ltd. Sept. 11, 1935. 481,522.

RUBBER SOLUTIONS AND CEMENTS.—E. I. du Pont de Nemours and Co. Sept. 11, 1935. 481,523.

MANUFACTURE OF POLYVINYL ACETALS.—I. G. Farbenindustrie. Sept. 14, 1935. 481,532.

MANUFACTURE OF MONO-AZO-DYESTUFFS soluble in water.—W. W. Groves (I. G. Farbenindustrie.) Sept. 14, 1936. 481,570.

ALUMINUM BASE ALLOYS.—National Smelting Co. (Oct. 4, 1935. 481,571.

MANUFACTURE OF TANNING MATERIALS.—A. Carpmael (I. G. Farbenindustrie.) Sept. 14, 1936. 481,572.

MANUFACTURE AND PRODUCTION OF AZO DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie.) Nov. 13, 1936. 481,210.

MANUFACTURE AND PRODUCTION OF TANNING AGENTS.—I. G. Farbenindustrie, G. W. Johnson. Nov. 19, 1936. 481,308.

PRODUCTION OF OLEFINE ETHERS.—Carbide and Carbon Chemicals Corporation. Jan. 7, 1936. 481,220.

LOW-TEMPERATURE DISTILLATION OF LIQUID or solid carbonaceous material.—B. Blakemore. Dec. 18, 1936. 481,456.

MANUFACTURE OF GOODS of or containing sponge-like or cellular rubber.—International Latex Processes, Ltd., A. N. Ward, and F. T. Purkis. Dec. 21, 1936. 481,316.

PIGMENT.—Burgess Titanium Co. Jan. 13, 1936. 481,317.

MANUFACTURE AND PRODUCTION OF VINYL ETHERS.—Coutts and Co., F. Johnson, and G. W. Johnson (I. G. Farbenindustrie.) Sept. 11, 1936. 481,389.

SOLIDIFYING LIQUID HYDROCARBONS.—J. M. G. Pouettre. Feb. 19, 1936. 481,392.

DESULPHURISATION OF HYDROCARBONS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. April 13, 1936. 481,235.

LIQUID XYLYLHEPTADECYL KETONES and processes of preparing the same.—Armour and Co. Oct. 8, 1936. 481,338.

MANUFACTURE OF DIARYL ARYLENE DIAMINES.—United States Rubber Products, Inc. April 18, 1936. 481,465.

TREATMENT OF GASES from furnaces for the production of aluminium.—Norske Aktieselskab for Elektrokemisk Industri. April 25, 1936. 481,467.

MANUFACTURE OF CARBOXYLIC ACID ESTERS of aromatic sulpho-dicarboxylic acids.—Soc. of Chemical Industry in Basle. May 23, 1936. (Sample furnished.) 481,346.

PREPARATION OF  $\beta$ -(*p*-OXYPHENYL)-ISOPROPYL METHYLAMINE.—Knoll, A.-G., Chemische Fabriken. May 26, 1936. (Samples furnished.) 481,397.

DISAZO DYESTUFFS and their preparation.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. June 30, 1936. 481,477.

PRODUCTION OF NEUTRAL AND BLEACHED SOAPS.—C. E. Rost, and H. Wortmann. July 12, 1937. 481,481.

MANUFACTURE AND TREATMENT OF CELLULOSE ESTERS.—British Celanese, Ltd. Sept. 30, 1936. 481,414.

MANUFACTURE OF ISO-CYCLIC COMPOUNDS.—W. W. Groves (I. G. Farbenindustrie.) June 5, 1936. (Samples furnished.) 481,557.

### Books Received

RANCIDITY IN EDIBLE FATS. By C. H. Lea. London: His Majesty's Stationery Office. Pp. 230. 3s. 6d.

PRACTICAL METHODS FOR DEPRECIATION OF FACTORY EQUIPMENT. By F. W. Gordon. London: Arthur H. Stockwell, Ltd. Pp. 63. 3s. 6d.

REPORTS OF THE PROGRESS OF APPLIED CHEMISTRY. Issued by the Society of Chemical Industry. Vol. XXII—1937. London: Society of Chemical Industry. Pp. 818. 12s. 6d.

## Forthcoming Events

### London.

**April 2.**—Royal Institution of Great Britain, 21 Albemarle Street, W.1. 3 p.m. W. L. Bragg, "Some Scientific Problems of Industry; Refractories."

**April 4.**—Society of Chemical Industry. Joint Meeting with the Chemical Engineering Group, Burlington House, Piccadilly, W.1. 8 p.m. Major H. J. W. Bliss, "Modern Trade Mark Law."

### Birmingham.

**March 30.**—Institute of Chemistry, Birmingham and Midland Section Annual Meeting.

**April 5.**—Society of Chemical Industry. Chamber of Commerce Buildings, New Street. 7.30 p.m. Annual Meeting. D. W. Parkes and R. B. Evans, "A New Absorbent for the Recovery of Carbon Dioxide."

Electrodepositors' Technical Society. Birmingham Conference, "Bright Metal Coatings."

### Hull.

**March 28.**—Society of Chemical Industry. Joint Meeting of Yorkshire Section, the Food Group and the Hull Chemical and Engineering Society. 3.45 p.m. Visit to the Refinery of British Cod Liver Oil Producers (Hull), Ltd. 6 p.m. Reception room of the Refinery, K. McLennan, "The Production and Utilisation of Cod Liver Oil"; Dr. G. A. Reay, "Recent Research on the Preservation of Fish as Food"; Dr. J. A. Lovern, "Some Aspects of Variation in the Composition of Fish."

### Liverpool.

**March 30.**—British Association of Chemists. Liverpool Section Dinner, Constitutional Club, India Buildings, Water Street, 7 p.m. 8.30 p.m. Professor E. C. C. Baly, "Reminiscences."

### Manchester.

**March 31.**—The Chemical Society. The University, 4 p.m. Annual General Meeting. 7.30 p.m. Anniversary Dinner, Midland Hotel.

**April 1.**—The Chemical Society. 4.15 p.m. The Pictet Memorial Lecture by Professor G. Barger. 8.30 p.m. Reception by the Council of Manchester University.

**April 5.**—Society of Chemical Industry (Manchester Section). Annual General Meeting, Constitutional Club, St. Ann's Street. 7 p.m.

### Newcastle.

**March 31.**—Coke Oven Managers' Association. H. M. Lowe, "Tar Distillation and Benzole Rectification."

### South Wales.

**March 29.**—Society of Chemical Industry. South Wales Section. J. H. G. Moneypenny, "Stainless Steels."

## Chemical and Allied Stocks and Shares

THE general situation in the industrial and kindred sections of the Stock Exchange has shown improvement this week, largely because of the lessened tension in international affairs. As a result prices have tended to recover part of the heavy declines shown recently. At the time of writing the majority of leading industrial securities are still below the prices current a week ago, and most market men are expressing the view that the fear of increased taxation is a factor tending to prevent expansion of business in all sections of the Stock Exchange.

Shares of chemical and allied companies were more active this week. Imperial Chemical, which attracted considerable attention, are 29s. 9d. at the time of writing, an increase of 1s. over the price ruling a week ago. The better price reflects attention drawn to the apparently attractive yield and also the view that it is unlikely the directors would have raised the dividend to 8½ per cent. unless there were reasonable possibilities of maintaining this rate for the current year. The meeting of the company, which is to be held on April 21st continues to be awaited in view of the interesting review invariably provided. British Oxygen received a good deal of attention, have improved from 71s. 10½d. to 73s. 9d. at the time of writing. The yield on the basis of the 15 per cent. dividend, is not large, and although the market is not looking for a higher dividend, it is generally expected there will be some form of bonus. Murex have moved up sharply to 83s. 9d. in response to current dividend estimates, which range up to 25 per cent. Lever and Unilever have fluctuated in advance of the dividend announcement and are lower on balance at 35s. 9d., but are well above the lowest price touched recently. United Premier Oil and Cake 5s. ordinary shares were active, having remained under the influence of satisfaction with the recent dividend announcement. British Oil and Cake Mills preferred ordinary are unchanged at 46s. 3d., at the time of writing.

Pinchin Johnson have been active following the statement at

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

**SILVER SPRINGS BLEACHING AND DYEING CO., LTD.**, Congleton. (M., 26/3/38.) March 9, agreement supplemental to debenture dated April 7, 1932, to Union Bank of Manchester, Ltd., securing all interest on moneys secured by the debenture as from January 1, 1938; charged on company's undertaking, goodwill and other property whatsoever and wheresoever both present and future including its uncalled capital. \*£19,015. August 18, 1937.

**J. H. LLOYD AND CO., LTD.**, London, E.C., manufacturers textile fabrics. (M., 26/3/38.) March 14, £5,000 debenture to J. Stulzmuller, London; general charge. \*Nil. Oct. 19, 1936.

### Satisfaction

**PILCHERS, LTD.**, London, W., paint manufacturers, etc. (M.S., 26/3/38.) Satisfaction March 14, of debentures registered January 20, 1931, to extent of £5,000.

### County Court Judgment

(Note.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

**VALENTINE, C. G. (male).** 264 High Street, Porth, manufacturing chemist. (C.C., 26/3/38.) £18 7s. 10d. Feb. 10.

the meeting, and at 29s. 6d., and have recovered strongly from the lowest price touched recently, although the current price is still fully 1s. below that of a week ago. Wall Paper deferred at 36s., are also lower on balance. Indestructible Paint and International Paint were fairly steady at 77s. 6d., and 67s. 6d. respectively. Goodlass Wall have a steadier appearance at 11s., the assumption in the market being that the forthcoming results are likely to show the maintenance of the dividend at 7 per cent. International Nickel fluctuated in accordance with the day-to-day trend of New York markets, but most internationally-dealt-in shares had a better appearance, particularly leading oil shares, such as "Shell," and Royal Dutch, which were among the securities most affected by the recent sharp reaction in values. Swedish Match are 29s. 6d. at the time of writing.

Boots Pure Drug at 42s. 6d. have a steadier appearance. Timothy Whites and Taylors are also reported to be firmer at 25s. 6d., pending publication of the results. Sangers have improved a few pence to 20s. 10½d. British Drug Houses were unchanged at 23s. 9d., as were British Industrial Plastics at 2s. 4½d. and British Glues at 5s. 7½d.

Associated Portland Cement were active following publication of the results, but at 74s. 4½d. have not held best prices touched this week. The report indicates that the company's "record" turnover was not sufficient to offset the influence of increased production costs, with the result that profits were moderately lower. As previously announced, the dividend is maintained at 22½ per cent. Tunnel Cement shares were firmer at 38s. 9d., following publication of the full results. British Aluminium were active around 46s. 6d. The report of this company, which confirms the raising of the dividend from 10 per cent. to 12½ per cent., refers to increased capital expenditure last year. It is doubtful, however, if more than very small benefits have yet accrued from the additional capital raised.

Dorman Long and Consett Iron showed improvement.

## Weekly Prices of British Chemical Products

THE demand for general chemicals during the past week has been on a very moderate scale and movements have been more or less limited to small quantities to cover nearby requirements. The absence of any fresh long-term buying is attributed in some quarters to over production in the consuming industries and until existing stocks are liquidated the demand for industrial chemicals will remain restricted. A small inquiry is circulating for most of the potash and soda compounds and a little better interest has been displayed in tartaric and citric acids. Lead oxides are £1 per ton dearer as a result of the increase in the price of the metal, but lead acetate remains competitive. Values for most products continue on a steady basis with a firm undertone and there are no important price changes to record for general chemicals, rubber chemicals and wood distillation products. There is little change in the market conditions for coal tar products, and in the absence of any firm buying orders quotations are nominal.

MANCHESTER.—Although conditions generally have been a little

more cheerful than they were a week ago, there has been no appreciable improvement in the volume of new business passing on the Manchester chemical market during the past week, current orders relating mostly to small quantities for near delivery positions. On the whole, however, whilst there has been a falling off here and there, delivery specifications for the leading heavy chemicals against old contracts have been maintained on a fairly satisfactory scale. Price conditions are mostly steady. With regard to the tar products slow trading conditions in most sections have been reported this week and there is no sign of immediate revival. In these circumstances values of most descriptions of materials continue easy in tone.

GLASGOW.—Business in general chemicals has been rather quiet during the week, both for home trade and export. Prices, however, continue very steady at about previous figures, with no important changes to report.

### General Chemicals

#### ACETONE.—£45 to £47 per ton.

ACETIC ACID.—Tech., 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 2s. 6d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10 1/2d. to 1s. 0 1/2d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2 1/2d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £19 per ton, ex wharf.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8 1/2d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHROMETAN—Crystals, 2 1/2d. per lb.; liquor, £19 10s. per ton d/d, station in Crumps. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—9 1/2d. per lb., less 2 1/2%; d/d U.K.

CHROMIUM OXIDE.—11d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0 1/2d. per lb. MANCHESTER: 1s. 0 1/2d. SCOTLAND: B.P. crystals, 1s. 0 1/2d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£21 7s. 6d. per ton, less 2% in casks. MANCHESTER: £19 5s. per ton f.o.b. SCOTLAND: £19 5s. per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2 1/2%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £4 12s. 6d. to £5 12s. 6d. per cwt. according to quantity; in drums, £4 5s. 0d. to £4 17s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Re-sublimed B.P., 6s. 4d. per lb. in 7 lb. lots.

### Price Changes

**Rises:** Lead, red; Salt Cake; Carbolic Acid, crude, 60's.

**Falls:** Bleaching Powder; Soda, caustic, solid 76/77%, spot; Sodium Silicate; Carbolic Acid, crystals (Manchester); Creosote, home trade; Cresylvic Acid, 97/99%; Pale, 99/100%; Dark, 95%; Naphthalene, crude, whizzed or hot pressed; Refined (Manchester); Pitch (Manchester).

descriptions of materials continue easy in tone.

GLASGOW.—Business in general chemicals has been rather quiet during the week, both for home trade and export. Prices, however, continue very steady at about previous figures, with no important changes to report.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £32; brown, £1 per ton less. MANCHESTER: White, £32; brown, £31.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£32 15s. 0d. 10 cwt. to 1 ton, less 2 1/2% carriage paid. SCOTLAND: £32 per ton, less 2 1/2% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £32 per ton, less 2 1/2%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 10d. per lb.; powder B.P., 6s. 0d.; bichloride B.P. (corros. sub.) 5s. 1d.; powder B.P. 4s. 9d.; chloride B.P. (calomel), 5s. 10d.; red oxide cryst. (red precip.), 6s. 11d.; levig. 6s. 5d.; yellow oxide B.P. 6s. 3d.; persulphate white B.P.C., 6s. 0d.; sulphide black (hyd. sulph. cum sulph. 50%), 5s. 11d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3 1/2d. per lb.

POTASH CAUSTIC.—Solid, £35 5s. to £36 15s. per ton for 2-ton lots ex store; broken, £42 per ton. MANCHESTER: £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4 1/2d. per lb. MANCHESTER: £37 10s. per ton.

POTASSIUM DICHROMATE.—5 1/2d. per lb. carriage paid. SCOTLAND: 5 1/2d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 5s. 6d. per lb. in 7 lb. lots. POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9 1/2d. per lb. SCOTLAND: B.P. Crystals, 9 1/2d. MANCHESTER: B.P. 10 1/2d. to 1s.

POTASSIUM PRUSSIATE.—6 1/2d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6 1/2d.

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77% spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77%, £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

**SODIUM ACETATE.**—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

**SODIUM BICARBONATE.**—Refined spot, £10 10s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.

**SODIUM BISULPHITE POWDER.**—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

**SODIUM CARBONATE MONOHYDRATE.**—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

**SODIUM CHLORATE.**—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

**SODIUM DICHROMATE.**—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts. MANCHESTER: SODIUM CHROMATE.—4½d. per lb. d/d U.K. 4d. per lb. GLASGOW: 4½d. net, carriage paid.

**SODIUM HYPOSULPHITE.**—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

**SODIUM METASILICATE.**—£14 5s. per ton, d/d U.K. in cwt. bags.

**SODIUM NITRATE.**—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.

**SODIUM NITRITE.**—£18 5s. per ton for ton lots.

**SODIUM PERBORATE.**—10%, 9½d. per lb. d/d in 1-cwt. drums.

**SODIUM PHOSPHATE.**—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £15 to £16 per ton delivered for ton lots.

**SODIUM PRUSSIATE.**—d. per lb. for ton lots. GLASGOW: 5d. to 5½d. ex store. MANCHESTER: 4½d. to 5½d.

**SODIUM SILICATE.**—£8 2s. 6d. per ton.

**SODIUM SULPHATE (GLAUBER SALTS).**—£3 per ton d/d.

**SODIUM SULPHATE (SALT CAKE).**—Underground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.

**SODIUM SULPHIDE.**—Solid 60/62%. Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

**SODIUM SULPHITE.**—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

**SULPHUR PRECIP.**—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

**SULPHURIC ACID.**—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

**TARTARIC ACID.**—1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1½d. per lb. GLASGOW: 1s. 1d. per lb., 5%, ex store.

**ZINC SULPHATE.**—Tech., £11 10s. f.o.r., in 2 cwt. bags.

### Rubber Chemicals

**ANTIMONY SULPHIDE.**—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

**ARSENIC SULPHIDE.**—Yellow, 1s. 5d. to 1s. 7d. per lb.

**BARYTES.**—£6 to £6 10s. per ton, according to quality.

**CADMIUM SULPHIDE.**—6s. to 6s. 3d. per lb.

**CARBON BLACK.**—4d. per lb., ex store.

**CARBON DISULPHIDE.**—£31 to £33 per ton, according to quantity, drums extra.

**CARBON TETRACHLORIDE.**—£41 to £46 per ton, according to quantity, drums extra.

**CHROMIUM OXIDE.**—Green, 10½d. to 11d. per lb.

**DIPHENYLQUANTIDINE.**—2s. 2d. per lb.

**INDIA-RUBBER SUBSTITUTES.**—White, 4½d. to 5½d. per lb.; dark 4d. to 4½d. per lb.

**LAMP BLACK.**—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

**LEAD HYPOSULPHITE.**—9d. per lb.

**LITHOPONE.**—30%, £17 to £17 10s. per ton.

**SULPHUR.**—£9 to £9 5s. per ton. **SULPHUR PRECIP. B.P.**, £55 to £60 per ton. **SULPHUR PRECIP. COMM.**, £50 to £55 per ton.

**SULPHUR CHLORIDE.**—5d. to 7d. per lb., according to quantity.

**VERMILION.**—Pale, or deep, 5s. per lb., 1-cwt. lots.

**ZINC SULPHIDE.**—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

### Nitrogen Fertilisers

**AMMONIUM SULPHATE.**—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

**CALCIUM CYANAMIDE.**—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.

**NITRO CHALK.**—£7 10s. 6d. per ton up to June 30, 1938.

**SODIUM NITRATE.**—£8 per ton for delivery up to June 30, 1938.

**CONCENTRATED COMPLETE FERTILISERS.**—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

**AMMONIUM PHOSPHATE FERTILISERS.**—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

### Coal Tar Products

**BENZOL.**—At works, crude, 9½d. to 9½d. per gal.; standard motor, 1s. 2½d. to 1s. 3½d.; 90%, 1s. 3½d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8½d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d.

**CARBOLIC ACID.**—Crystals, 7½d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 3s. 6d. to 3s. 9d.; dehydrated, 4s. 4½d. to 4s. 7½d. per gal. MANCHESTER: Crystals, 7½d. per lb. f.o.b. in drums; crude, 3s. to 3s. 6d. per gal.

**CREOSOTE.**—Home trade, 5½d. per gal., f.o.r. makers' works; exports, 6½d. to 6½d. per gal., according to grade. MANCHESTER: 4½d. to 5½d. GLASGOW: B.S.I. Specification, 6d. to 6½d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5½d. to 6½d.

**CRESYLIC ACID.**—97/99%, 2s. 5d. to 2s. 8d.; 99/100%, 4s. to 5s. 6d. per gal., according to specification; Pale, 99/100%, 2s. 9d. to 3s.; Dark, 95%, 2s. 4d. to 2s. 5½d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 3s. to 3s. 3d.

**NAPHTHA.**—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

**NAPHTHALENE.**—Crude, whizzed or hot pressed, £5 10s. to £6 10s. per ton; purified crystals, £14 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 10s. to £7 per ton. GLASGOW: Fire lighter, crude, £5 to £7 per ton (bags, free). MANCHESTER: Refined, £15 10s. per ton f.o.b.

**PITCH.**—Medium, soft, 34s. to 36s. per ton, f.o.b. MANCHESTER: 32s. f.o.b., East Coast. GLASGOW: f.o.b. GLASGOW: 35s. to 37s. per ton; in bulk for home trade, 35s.

**PYRIDINE.**—90/140%, 13s. 6d. to 15s. per gal.; 90/160%, 10s. to 13s. 3d. per gal.; 90/180%, 3s. 3d. to 4s. per gal. f.o.b. GLASGOW: 90%, 140, 10s. to 12s. per gal.; 90%, 160, 9s. to 10s.; 90%, 180, 2s. 6d. to 3s. MANCHESTER: 12s. to 13s. 6d. per gal.

**TOLUOL.**—90%, 1s. 10d. per gal.; pure, 2s. 2d. GLASGOW: 90%, 120, 1s. 10d. to 2s. 1d. per gal.

**XYLOL.**—Commercial, 2s. 1d. per gal.; pure, 2s. 3d. to 2s. 3½d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

**Wood Distillation Products**

**CALCIUM ACETATE.**—Brown, £7 10s. to £8 per ton; grey, £9 10s. to £10. MANCHESTER: Brown, £9 10s.; grey, £11 10s.

**METHYL ACETONE.**—40.50%, £35 to £40 per ton.

**WOOD CREOSOTE.**—Unrefined, 4d. to 6d. per gal., according to boiling range.

**WOOD NAPHTHA, MISCELL.**—3s. 3d. to 3s. 6d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.

**WOOD TAR.**—£2 to £8 per ton, according to quality.

**Intermediates and Dyes**

**ANILINE OIL.**—Spot, 8d. per lb., drums extra, d/d buyer's works.

**ANILINE SALTS.**—Spot, 8d. per lb. d/d buyer's works, casks free.

**BENZIDINE, HCl.**—2s. 7½d. per lb., 100% as base, in casks.

**BENZOIC ACID.**—1914 B.P. (ex toluol).—1s. 11d. per lb. d/d buyer's works.

**m-CRESOL.**—98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

**o-CRESOL.**—30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.

**p-CRESOL.**—34.5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

**DICHLORANILINE.**—2s. 1½d. to 2s. 5½d. per lb.

**DIMETHYLANILINE.**—Spot, 1s. 7½d. per lb., package extra.

**DINITROBENZENE.**—8½d. per lb.

**DINITROCHLOROBENZENE, SOLID.**—£79 5s. per ton.

**DINITROTOLUENE.**—48/50° C., 9½d. per lb.; 66/68° C., 11d.

**DIPHENYLAMINE.**—Spot, 2s. 2d. per lb., d/d buyer's works.

**GAMMA ACID.**—Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

**H ACID.**—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

**NAPHTHIONIC ACID.**—1s. 10d. per lb.

**β-NAPHTHOL.**—£97 per ton; flake, £94 8s. per ton.

**α-NAPHTHYLAMINE.**—Lumps, 1s. 1d. per lb.

**β-NAPHTHYLAMINE.**—Spot, 3s. per lb.; d/d buyer's works.

**NEVILLE AND WINTHER'S ACID.**—Spot, 3s. 3½d. per lb. 100%.

**o-NITRANILINE.**—2s. 3½d. per lb.

**m-NITRANILINE.**—Spot, 2s. 10d. per lb. d/d buyer's works.

**p-NITRANILINE.**—Spot, 1s. 10d. to 2s. 3½d. per lb. d/d buyer's works.

**NITROBENZENE.**—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

**NITRONAPHTHALENE.**—10½d. per lb.; P.G., 1s. 0½d. per lb.

**SODIUM NAPHTHIONATE.**—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

**SULPHANILIC ACID.**—Spot, 8½d. per lb. 100%, d/d buyer's works.

**o-TOLUIDINE.**—11½d. per lb., in 8/10-cwt. drums, drums extra.

**p-TOLUIDINE.**—2s. per lb., in casks.

**m-XYLIDINE ACETATE.**—4s. 8d. per lb., 100%.

## Company News

**A. Boake, Roberts and Co.**, announce a fourth interim of 1 per cent., tax free (same).

**Midland Tar Distillers, Ltd.**, have announced an interim of 2½ per cent., free of tax (same), on the ordinary shares.

**United Premier Oil and Cake Co.** announce a final dividend of 5 per cent. on the ordinary shares, making 10 per cent., less tax (same), in respect of 1937, and cash bonus of 2½ per cent., less tax (same).

**William Briggs and Sons, Ltd.**, manufacturers of bitumen products, announce that the half-yearly dividend on 5½ per cent. "A" and 6 per cent. "B" cumulative preference shares will be paid on March 31.

**Rugby Portland Cement Co.**, announce a final dividend on the ordinary shares of 6 per cent. actual, less tax, making 11 per cent. (same). Dividend will be payable on April 20 to shareholders registered March 30.

**J. and E. Atkinson, Ltd.**, perfumery and toilet soap manufacturers, announce a dividend of 6 per cent., less tax (5 per cent.), on the ordinary shares and dividend of 6 per cent. per annum, tax free, on the preference shares for half-year ended December 31, 1937, both to be paid on April 6. The profit for 1937 was £42,808 (£37,428).

**Cheshire United Salt Co.**, announce an interim of 3 per cent. on the ordinary; interim of 3 per cent. on the 5 per cent. preferred ordinary, in addition to fixed half-yearly dividend of 2½ per cent. (For year ended June 30, 1937, no interim was paid, dividend for year being 3 per cent. on ordinary and 3 per cent. additional on preferred.)

**British Coal Distillation, Ltd.**, are proposing a capital reconstruction scheme. The total required to write down the book value of assets and to write off the debit balance on profit and loss, etc., is £329,953. This will be provided by reducing the nominal capital from £900,000 to £570,047 by cancelling the ordinary shares held at the disposal of the company and by writing 8s. off each of the other issued £1 ordinary shares and 3s. off each of the issued 5s. deferred shares. The existing ordinary shareholders will forgo their special rights and will receive six shares of 2s. each in the place of each existing £1 ordinary share. The deferred shareholders will give up in part to the ordinary shareholders their right to receive all surplus assets and 75 per cent. of the surplus profits and will receive one 2s. share in the place of each existing 5s. deferred share. As a result there will be in issue 3,023,820 shares of 2s. each all of one class, of which 1,535,040 will belong to the existing ordinary shareholders and 1,588,780 will belong to the existing deferred shareholders.

**National Drug and Chemical Co. of Canada** show a net profit for eleven months to December 31, of £35,570 (£31,824 for previous twelve months); deduct dividends on cumulative participating preference shares £19,483 (nil); balance forward £80,346 (£64,260).

**English Steel Corporation** show trading profits (after providing for contingencies) of £1,317,399, an increase of £257,953. After providing £360,000, against nil, for tax and N.D.C., the net profit is down from £722,452 to £649,809. The deferred ordinary dividend is maintained at 20 per cent., tax free, leaving the carry-forward at £73,105, compared with £71,976 brought in.

**Elythe Colour Works** announce that the net profit for 1937, after providing for depreciation, amounted to £34,218 (£35,718 for period January 25 to December 31, 1936). To tax and N.D.C., £7,026 (£6,882); to general reserve £5,000 (same); final on ordinary of 12½ per cent., making 17½ per cent. (same); forward, £7,541 (subject to preference dividend accrued to December 31, 1937, £1,500).

**Jenson and Nicholson, Ltd.**, in their report for 1937, shows trading profit £78,230, against £64,648, and net profit £61,067 (£48,351). Income-tax and N.D.C. £18,227 (£12,166); provision for contingencies in respect of Spanish assets, £1,200 (£4,500); to preference dividend reserve, £4,613 (£2,236); dividend on ordinary at 15 per cent., less tax (10 per cent.), £6,050 (£4,268); to general reserve £6,500 (£2,500); forward £4,527 (£3,238).

**International Paint and Compositions Co.**, announce that net profits for 1937 reach the peak figure of £158,295, which is £32,671 more than for 1936. The directors intend placing £20,000 to investment reserve, £15,000 to bad debts reserve, and £3,000 each to the development and staff benefit funds. In the previous year £20,000 was written off goodwill. It is proposed to increase the year's ordinary dividend by 4 per cent., to 20 per cent., by raising the final payment from 12 to 16 per cent. The carry-forward is £1,605 less at £17,939.

**British Aluminium Co.**, announce a further increase in trading profits of £171,512 to £765,128 for the year ended December 31 last. Income-tax takes £36,000 more at £70,000, and £50,000 is again reserved for depreciation. After deducting debenture interest and directors' fees, net profits amount to £488,182, an increase of £139,251. The year's dividend on the larger ordinary capital is raised 2½ per cent. to 12½ per cent., the amount payable on the new ordinary shares, calculated according to the terms of issue being £1 15s. 10d. per cent. The reserve allocation is doubled at £100,000, which leaves the carry-forward over £30,000 up at £101,424.

## New Companies Registered

**Commercial Development Laboratories, Ltd.** 337,270.—Private company. Capital £500 in 500 shares of £1 each. To develop new industries, and to carry on the business of analytical and manufacturing chemists, etc. Subscribers: Sidney J. Bevington, 39 Annweir Avenue, Lancea, Sussex; Arthur Ellis.

**Charles Vernon and Company, Ltd.** 337,778.—Private company. Capital, £5,000 in 5,000 shares of £1 each. To carry on business as manufacturers of and dealers in water softening, filtering and purifying materials, chemicals, etc. Subscribers: Chas. S. Bowen, 23 Grove Terrace, Frizinghall, Bradford; Henry Sykes.

**Chemosan, Ltd.** 337,116.—Private company. Capital £100 in 100 shares of £1 each. To carry on the business of merchants, importers, exporters, agents, distributors, and manufacturers of chemicals, etc. Subscribers: Robert S. Fraser, 141 Moorgate, E.C.2; Geoffrey F. Aronson, Werner Arndt. Registered office: 141 Moorgate, E.C.2.

**Capsules, Ltd.** 337,982.—Private company. Capital, £1,100 in 1,000 preferred ordinary shares of £1 and 1,000 deferred ordinary shares of 2s. To acquire the business of a manufacturer of gelatine capsules now carried on by Harold M. Guest at Newton Works, Queen Street, Stretford, Lancs., as "Harold M. Guest," and to carry on the business of manufacturers of and agents for chemicals, etc. Directors: Harold M. Guest, 27 Hillingdon Road, Stretford, Lancs.; Charles Hopley. Registered Office: Newton Works, Queen Street, Stretford, Lancs.

**Grates Products, Ltd.** 337,787.—Private company. Capital, £3,000 in 3,000 shares of £1 each. To carry on the business of printers, dyers, bleachers and finishers of silk, artificial silk, and cotton, woollen and textile fabrics and soft goods of all kinds, manufacturers of chemicals, detergents, dyestuffs, etc. Directors: Albert G. Whale, 59 Weymouth Street, W.1; William H. Law, Max Von Grab, Stefan Rudo, Arnold Teltsch, Theodore J. Dannhorn.

**Balladen Dyeing Company, Ltd.** 337,503.—Private company. Capital £5,000 in 5,000 shares of £1 each. To carry on the business of bleachers, sizers, dyers and finishers of cotton piece and other goods, etc. Directors: John Tomlinson, Jessfield, Helmshore Road, Helmshore, Manchester; Walter E. Worthington, William H. Fisher, Charles Fisher, Frank L. Allen. Registered office: The Holme, "Rawfenstall, Lancs."

**The Eaglescliffe Chemical Co., Ltd.** 337,857.—Private company. Capital, £20 in 20 shares of £1 each. To acquire the business referred to in an agreement with Urley Nook Holdings, Ltd., and to carry on the business of manufacturers of, agents for and dealers in chemicals and chemical preparations, dyewares, oils, paints, pigments, etc. Subscribers: Charles Osborne, 12 Boldmere Road, Eastcote, Middlesex; Harry Braten.

**Thurston and May, Ltd.** 338,084.—Private company. Capital, £1,000 in 1,000 shares of £1 each. To carry on the business of manufacturers of and dealers in cleansing products, and all other descriptions of solvents, cleansing materials, deodorisers and disinfectants, refiners and manufacturers of chemicals, or chemical substances, etc. Directors: John W. Thurston, 5 Long Ridges, Fortis Green, N.2; Jack May. Registered Office: 4 Broad Street Place, Finsbury Circus, E.C.2.

## Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

**Brazil.**—An agent recently established at Bahia, Brazil, wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of paints, varnishes, lacquers, chemicals, dyes. (Ref. No. 208.)

